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2,668,704

APPARATUS FOR DISPENSING STACKED SHEET MATERIAL

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3 Sheets-Sheet 1

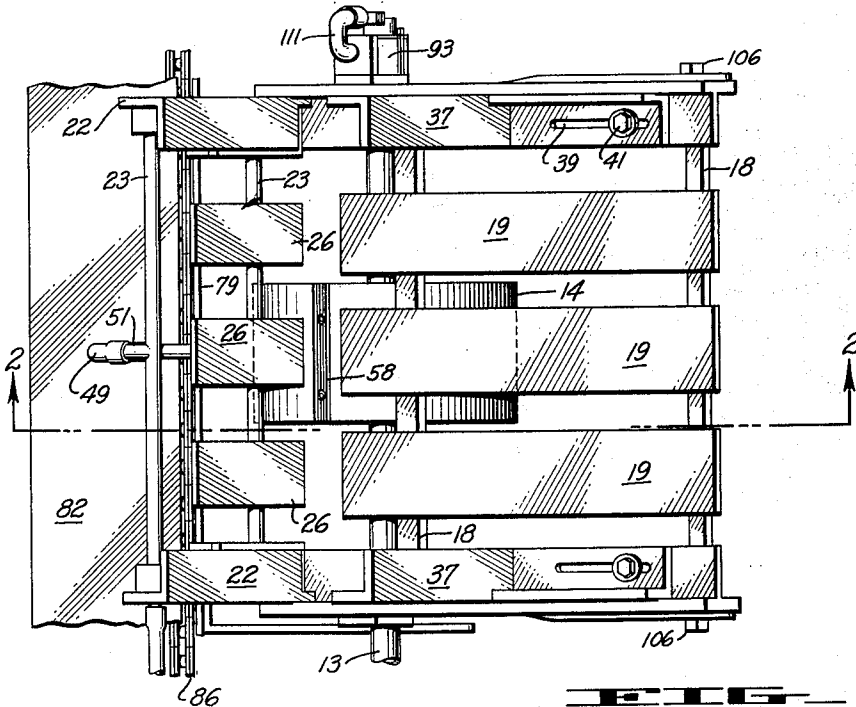


FIG. 1

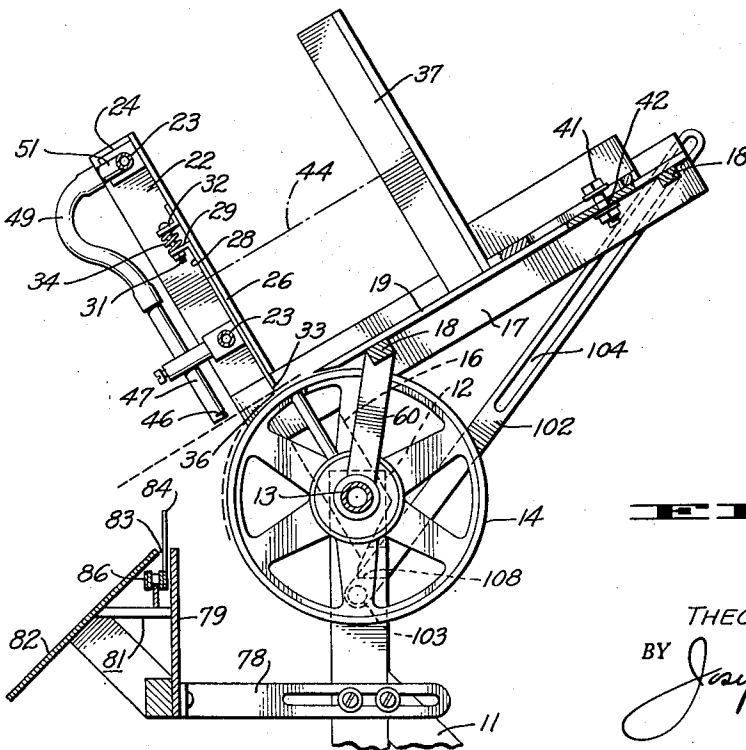


FIG. 2

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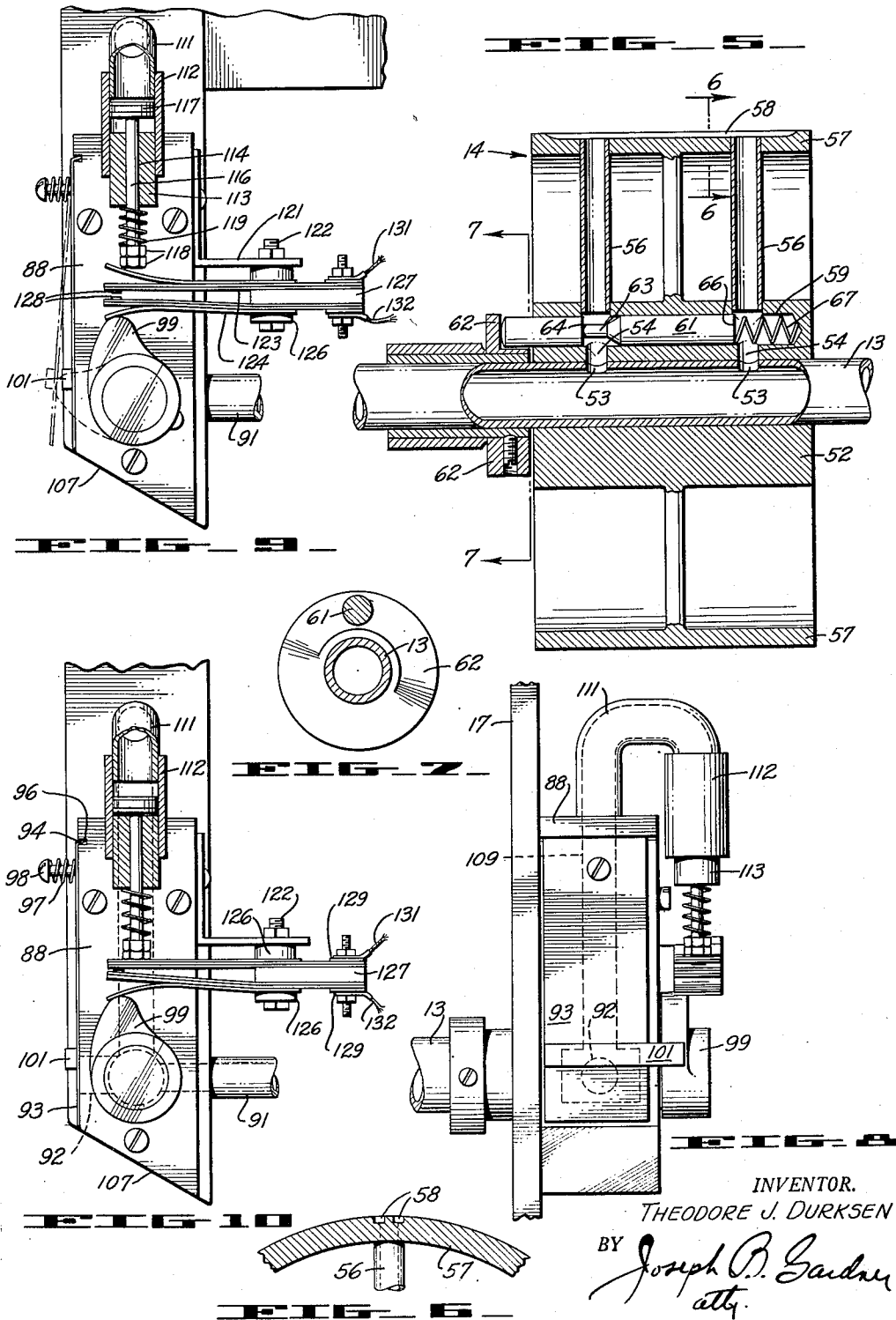
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UNITED STATES PATENT OFFICE

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APPARATUS FOR DISPENSING STACKED SHEET MATERIAL

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7 Claims. (Cl. 270—54)

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This invention relates to apparatus for the lateral displacement feeding of successive units of sheet material from a supply stack and preferably from the bottom of the latter.

An object of the invention is to provide feed mechanism particularly adapted to the dispensing of singly or multiply folded sheets of material.

Another object of the invention is to provide in combination with a preferably continuously moving takeaway conveyor, dispensing apparatus of the character described which is capable of opening and delivering units of stacked and folded sheet material in prescribed sequence to the conveyor so that the said units are arranged in uniformly spaced relation on the conveyor.

A further object of the invention is to provide improved underfeed apparatus for stacked sheet material which is positive in its gripping of the successive sheets and which is arranged for activation and deactivation instantaneously at precise operational intervals so as to accurately advance and deliver successive sheets to the takeaway conveyor.

Still another object of the invention is to provide apparatus of the class described which is capable, by positional adjustment, of selectively compensating for increased feed resistance which occurs when sheets of rough or unglazed surface texture are being handled or which is occasioned by supply stacks of abnormal height.

Yet another object of the invention is to provide, in apparatus of the character referred to, improved suction gripper means associated with the feed mechanism of the apparatus which, while being capable of tenacious adherence to a sheet of material being fed will not so deform portions of the latter as to leave permanently perceptible indentations therein.

It is another object of the invention, in mechanism including a cyclically movable suction gripper which is controlled by valving means to engage and release individual units of sheet material in a supply stack thereof so as to transport successive of said units from the stack to relatively spaced receiving means, to provide for positional adjustment between the supply stack and receiving means and to maintain operational synchronism between the gripper and its valving means regardless of variations in the degree of spacing between the supply stack and receiving means.

It is an additional object of the invention to provide, in apparatus of the class described, improved compound valve control means for estab-

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lishing and releasing suction in the type of gripper mechanism above referred to.

An important object of the invention is to provide, in mechanism utilizing a movable gripper element whose gripping action is effected by suction powered means, a safety control device capable of detecting the presence or absence of a paper sheet in possession of the gripper element so as to permit, in the former case, repeated movements of the gripper element in feeding sheets from a supply stack to a receiving means and, in the second case, to stop movements of the gripper element.

A still further object of the invention is to provide, in suction actuated mechanism including a movable gripper head for feeding successive sheets of material from a vertical stack, improved construction for said gripper head whereby suction adhesion between the latter and each sheet of material is effected in a plurality of closely adjacent areas of the sheet rather than in a single larger area so as to enhance the gripping action of the head with the sheet material.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claims.

Referring to the drawings:

Figure 1 is a top plan view of portion of a signature gathering machine showing the improved feeding mechanism of my invention associated therewith.

Figure 2 is a vertical sectional view taken in the plane indicated by the line 2—2 of Figure 1.

Figure 3 is a view similar to Figure 2 showing the stack support positioned to lessen stack weight on the lowermost signature adjacent the pick-up point thereof by the suction grip of the rotor.

Figure 4 is a view for the most part diagrammatic in character showing the fluid and electric circuits interconnecting the rotor, its drive motor and the mis-feed safety device.

Figure 5 is an enlarged vertical sectional view taken in the plane indicated by the line 5—5 of Figure 3.

Figure 6 is a vertical sectional view taken in the plane indicated by the line 6—6 of Figure 5.

Figure 7 is a vertical sectional view taken in the plane indicated by the line 7—7 of Figure 5.

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Figure 8 is an enlarged side elevational view of the vent and safety unit shown on the upper end of the drive shaft of Figure 1.

Figure 9 is a rear end elevational view of the structure illustrated in Figure 8 showing the mis-feed detector switch in normal operating condition permitting uninterrupted successive feeding of signatures from the stack thereof.

Figure 10 is a view similar to Figure 9 showing the operative positions of the mis-feed detector switch in the event that the suction gripper fails to establish proper cohesive engagement with a signature.

Gathering machines used in book binderies comprise hopper or the like storage units in which singly or multiply folded printed sheets comprising the signatures may be placed to be fed therefrom and draped over a movable saddle member or conveyor in proper sequence to form unit groups of the signatures, the groups being thereafter stapled or otherwise bound together to form books or pamphlets. The machines of this character which have been previously available commercially have been rather complicated structurally so that the average small bindery cannot economically acquire them and the complex mechanisms for feeding, opening and delivering the signatures to the gathering conveyor so retard movement of the signatures from initial to final position that ultimate production speed is not realized. I have provided an improved feeder which not only unfailingly delivers signatures to a gathering conveyor or the like along a travel path of minimum length so that maximum production speed may be effected, which also simultaneously opens each signature by a novel operational procedure and which further functions to immediately stop the machine should the feeding device fail for any reason to properly deliver a signature in proper sequence to the gathering conveyor. In the form in which I have chosen to illustrate the invention, the members 11 represent a frame or other support structure which extend downwardly to engage a shop floor or other base member not shown. Journaled in suitable brackets 12 rising from the frame members 11 is an axially horizontal tubular suction header and drive shaft 13 on which is secured a plurality of axially spaced cylindrical rotors 14 each of which has a peripheral face width slightly in excess of the maximum width of signature to be fed. Only one rotor and feed unit is shown herein since all are duplicates of each other and the number of feeder units used in a complete machine depends on the size of the compiled book or pamphlet and the number of separate signatures which make up the latter.

Disposed above the rotor 14 is a hopper comprising arm members 16 journaled at their lower ends on the drive shaft 13 and carrying at their upper ends rectangularly extending base bars 17 to the inner and outer portions of which are secured cross bars 18 forming supports for the hopper bottom straps 19 which, as best shown in Figures 2 and 3 have their upper surfaces disposed substantially tangent with the periphery of the rotor 14, the centermost strap 19 approaching and terminating short of the rotor periphery in a knife edge 21. Secured to and rising from the base bars 17 at opposite corners of the frontal edge of the hopper bottom adjacent to and above the rotor 14 are post members 22 preferably constructed of angle bar or other light weight structural shape, which are joined at their upper and lower end portions by preferably tubular cross

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members 23 the upper one of which comprises a supply duct, being connected to a suitable source of air under greater than atmospheric pressure. Blocks 24 or similar bracket elements secured to the cross members 23 carry vertical bars 26 arranged in planar alignment with the rearward faces of the post members 22 to form a vertical frontal end wall for the hopper, the lower ends of the bars 26 terminating in vertically spaced relation to the top surface of the bottom straps 19 to provide a lateral opening 27 extending across the front of the hopper. One of the bars 26, preferably the centermost one thereof, is provided with a contiguously disposed vertical gauging bar 28 having a horizontal flange 29 at its upper end which is threadedly engaged with an adjusting screw 31 carried by a bracket 32 fixed to the adjacent bar 26 and having a bevelled lower end surface 33 facing the interior of the hopper. A coil spring 34 is interposed between the bracket 32 and the flange 29 and the gauging bar 28 is thus mounted to be adjustably vertically positioned so as to provide a feed gap 36 of selectively variable dimension between the lower end of the gauging bar and the subjacent peripheral surface of the rotor 14. The rear of the hopper is formed by a pair of vertically disposed angle bars 37 substantially rearwardly aligned with the corner posts 22 and carried by base members 38 preferably provided with slots 39 for receiving mounting bolts or screws 41 engaged in suitable apertures 42 formed in the underlying bottom straps 19. Others of the bottom straps may be provided with similar apertures 43 so that the positions of the angle bars 37 may be selectively varied if desired. The recessed portions of the angle bars 37 are arranged to face each other and the hopper front wall to form a pocket for the reception of a stack 44 of signatures or other sheet members to be dispensed. Usually these signatures are singly or multiply folded sheets and are arranged in stack 44 so that their cut or free edges face and abut against the front wall member of the hopper, the feed gap 36 being sized so that only the folded sheet comprising a single signature may pass between the lower end of the gauging bar 28 and the periphery of the rotor 14. To effect relative separation of the signature sheets if the latter have a tendency of adhering a continuous blast of air may be directed at and between the sheets from a jet orifice 46 formed in the bottom end of the pipe 47, which is carried by and vertically adjustable in a bracket 48 mounted on the hopper front and which is connected by a flexible conduit 49 or the like with a nipple 51 extending from a side of the upper compressed air supply duct 23.

Means are provided for revolving the rotor 14 and for effecting gripping thereby of successive lowermost signatures of the stack so as to feed said signatures in measured sequence from the hopper. As will be best seen in Figures 5 and 6, the tubular drive shaft 13 in the hub 52 of the rotor is provided with at least one and preferably two radial apertures 53 opening into passages 54 drilled radially of the hub and communicating with ends of tubular conduits 56 extending outwardly through the rim 57 of the rotor and opening into the bottoms of preferably a plurality of parallelly adjacent grooves 58 extending axially across the periphery of the rotor and terminating short of the peripheral side edges thereof. In the hub 52 is drilled a cylindrical recess 59 in which is slidable a cylindrical valve plunger 61 extending at one end beyond an end of the

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hub 52 and engaged with a radial face cam 62 fixed to one end of an arm 60 attached to and projecting downwardly from the hopper superstructure. The valve plunger 61 is formed intermediate its ends with a peripheral groove 63 having a transaxial face 64 at one side thereof which cooperates with the inner end surface 66 of the plunger to divide the latter into separate valve elements movable across the passages 54 to shut off the conduits 56 from the drive shaft or suction header 13 or to establish communication therebetween. A coil spring 67 interposed between the extreme inner end of the valve plunger and the bottom of the recess 59 normally urges the plunger into engagement with the face of the cam 62.

As here shown, the drive shaft 13 is provided at one end with a rotary seal coupling 68 connecting the former with a stationary conduit 69 leading to a suitable suction pump not shown and the shaft is further fitted with a drive pulley 71 engaged with a belt 72 or equivalent means operatively connected with the pulley 73 of an electric motor 74 deriving energization from current mains 76 at least one of which is capable of control by an electro-magnetic relay 77 of the type in which the control contacts are closed when the relay is deenergized. The arrangement of the parts so far described is such that as the rotor 14 is revolved by its drive means, the peripheral grooves 58 comprising the suction gripper will be carried cyclically under and forwardly past the free or cut edges of the signatures of the stack. During such movement of the rotor the valve plunger 61 of Figure 5 will be held by the cam 62 toward the right hand end of the recess 59 so as to shut off the conduits 56 from the suction header 13. However as the suction gripper grooves 58 arrive under the forward edge of the lowermost signature the valve plunger will be permitted by the cam to move to its position shown in Figure 5 thereby admitting suction pressure to the grooves 58 and causing the aforesaid lowermost signature to adhere to the surface of the rotor. At this point it will be noted that it is preferred that the suction gripper comprise more than one parallel groove, as shown in Figure 6, for the reason that the signature sheet is thus caused to be deflected in a plurality of adjacent areas into the smaller grooves rather than being given a single deeper deflection into a wider groove. In this manner the gripper will cling to the signature sheet with greater tenacity and the chances of permanently marking the gripper sheets are substantially eliminated. As the rotor continues its movement in possession of the signature, the latter will be drawn through the feed gap 36 and upon emerging the sheets will encounter the blast from the air jet 46 so that while the lower sheet is carried downwardly in an arcuate path of movement by the rotor the upper sheet will progress generally horizontally outwardly from the hopper as shown by the dotted lines of Figure 2 until the signature has been fully withdrawn from the hopper and suction at the gripper grooves 58 has been released thereby releasing the signature from the rotor.

The released and opened signature is now delivered preferably gravitally to suitable takeaway conveyor means and is advanced by the latter to the next hopper of the gathering machine where a succeeding signature is delivered to the one already on the conveyor and so on until the complete book or pamphlet has been assembled after which the groups of signatures are passed

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through suitable stapling or other binding means which secure the groups together as integral units. One of the most widely used conveyors employed for receiving and transporting the signature groups is shown in Figures 1 and 2 wherein it will be seen adjustable brackets 78 secured to and extending from the support 11 carry at their outer ends an elongated planar vertical plate 79 to which is attached by outwardly extending cross members 81 a substantially similar vertically inclined plate 82 spaced at its upper edge from the plate 79 to provide an elongated gap 83 through which may project the upwardly extending fingers 84 carried by and at spaced intervals along a conveyor chain 86 which runs along a guide rail 87 carried by a cross member 81 and movable by suitable drive means familiar to those skilled in the art. The relatively inclined plates 79 and 82 form an elongated saddle extending across the fronts of all of the signature feed units used in the gathering machine and the fingers 84 are spaced apart equivalent to the spacing between adjacent feed units, the speed of the chain 86 being such that the latter advances a distance equal to the inter-unit spacing every time that the rotors 14 complete a cycle of rotation.

It will be noted that if the plunger valve 61 is permitted to close, prior to releasing the signature from the rotary suction gripper, while full suction pressure exists in the suction header 13, reduced pressure may be trapped in the conduits 56 and rotor grooves 58 with the result that the hold of the gripper on the signature will not be relinquished and the latter may be carried too far around the rotor and possibly damaged. Means is therefore provided for insuring that the suction pressure at the gripper grooves is not in excess of that at which the signatures will be easily released from the rotors. As is best shown in Figures 8 and 9, the end of the tubular drive shaft or suction header 13 is journaled in a relief valve block 88 carried by a hopper frame member 17 which has a chamber 89 therein into which enters a duct 91 communicating with the suction header and an oppositely disposed aperture 92 for venting the chamber 89 to the atmosphere. A flap valve 93, overlying and normally closing the aperture 92, is provided at its upper end with a flange 94 seated in a groove 96 formed in the block 88 so as to form a pivotal mounting for the flap valve and a spring 97 interposed between the head of a stud 98 and the adjacent flap valve serves to resiliently retain the valve in closed position. Secured to and extending laterally from a side of the flap valve and capable of being cyclically engaged by a cam 99 secured to and rotatable with the drive shaft or suction header 13 is a lug 101 so arranged, as shown by the dotted lines of Figure 9, that when engaged by the cam 99 the valve 93 will open to uncover the aperture 92. The arrangement and timing of the cooperative parts is such that the aperture 92 will be opened just prior to closing of the conduits 56 by the valve plunger 61 with the result that suction pressure in the header 13 and conduits 56 will drop to a point where the weight of the signature is sufficient to release the latter from the rotor suction gripper. As soon as the signature is released, the flap valve and plunger valve will close thus permitting suction pressure to again build up in the suction header to take care of the next cycle of operation of the feeder.

Due to the wide variation in surface finish of

the paper which may be used in the signatures, consideration must be given to the position of the signature stack 44 relative to the bottom of the hopper and the peripheral surface of the rotor so that the lowermost signature of the stack may be easily slid out from under the stack with the least amount of frictional resistance. For smooth papers or those of ordinary surface texture the hopper is tilted slightly forwardly, as shown in Figure 2, for best operating conditions while for rougher papers having higher frictional characteristics the hopper is tilted rearwardly away from the takeaway conveyor. Such tilting movement of the hopper is permissible due to the fact that the arm members 16 on which the hopper superstructure is carried are journaled on the drive shaft 13 as is the cam 62, and means are provided for limiting such tilting in one or more arm members 192 secured by pivot pins 103 or the like to the support 11 and having elongated slots 104 at their other ends engaged by suitable clamp screws 106 mounted in a convenient portion of the hopper superstructure. Preferably the lower ends of the arms 16 are formed with inclined surfaces 107 capable of engaging stop blocks 108 secured to the support 11 so as to limit the forward tilting range of the hopper. It will be seen that when the hopper is tilted forwardly as shown in Figure 2, the center of gravity of the signature stack will lie more directly above the feed gap 36 and the point of engagement of the signatures with the rotor 14 and consequently the greater part of the signature will be required to pass through this pressure area in its feeding movement. If the paper is of such quality that ready slippage cannot occur between adjacent signatures difficulty in feeding may be encountered such as failure of the rotor to properly grip the lowermost signature or the bottom sheet of the signature may be caused to lead the upper sheet in its feeding movement thereby rumpling the signature or causing failure in delivery of the latter to the takeaway conveyor. As the hopper is tilted further rearwardly the weight center is retracted backwardly of the stack with the result that improper feeding conditions may be overcome and successful handling of even very rough-textured paper may be realized.

The value of a gathering machine depends in great measure on its ability to unfailingly deliver signatures to each group thereof being accumulated on the takeaway conveyor so that all groups will contain a full complement of signatures when finally bound together. It is quite possible, unless continuous vigilance is exercised, that in a gathering machine containing a large number of signature feed units, accidental misfeeding of a signature or unnoticed depletion of a signature supply stack in the hopper of a unit may cause one or more of the signature groups to pass into the binder unit in incomplete form. I have provided simple and efficient means for instantaneously stopping the gathering machine in the event of a failure of a feed unit to deliver a signature so as to preclude the possibility of passing an incomplete group of signatures to the binding unit. Referring again to Figures 8, 9 and 10 it will be seen that a passage 109 is provided in the valve block 88 opening at its lower end into the chamber 89 and connected at its upper end to a conduit 111 or its equivalent which leads into a control cylinder 112 whose lower end is closed by a plug member 113 having a guide bore 114 extending axially thereof

and entering into and in concentric relation with the cylinder 112. A piston rod 116 slidable in the guide bore 114 carries a piston 117 at one end which is snugly slidable in the cylinder and is provided at its opposite or lower end with nut members 118 by means of which the effective length of the piston rod may be varied and forming means for engaging one end of a coil spring 119 whose other end bears against the plug member 113 to normally urge the piston rod toward the lower limit of its travel.

Secured to and extending from a side of the valve block 88 is a bracket 121 carrying a stud 122 to which is attached a pair of separate flexible switch arms 123 and 124 relatively electrically insulated by non-conducting washer and spacer elements 126 and 127 and carrying contacts 128 at their free ends. The said free ends of the arms 123 and 124 are disposed between the lower end of the piston rod 116 and the subadjacent path of movement of the cam 99 the upper arm 123 being engageable by the piston rod and the lower arm 124 being cyclically engageable by the cam in the latter's rotational movement. The upper arm 123 possesses an upward bias so that when the piston rod is positioned at its upper limit of travel as shown in Figure 9 the contact 128 of the upper arm will be held out of engagement with the contact of the lower arm 124 even at the point of greatest upward throw of the cam 99. Each arm 123 and 124 is provided with a terminal 129 one of which is connected by a lead 131, as shown in Figure 4, with a current lead 76, the other terminal being connected by a lead 132 with the actuating coil 133 of the relay 77. Current is supplied to the actuating coil 133 through a lead 134 interconnecting the coil and another of the current leads 76.

Under normal operating conditions when full and proper suction pressure exists in the suction header 13 the piston 117 will be drawn and held against the upper end of the cylinder 112. This will allow the upper switch arm 123 to remain fully upwardly flexed so that the lower contact 128, in its cyclic elevations and descensions every time that the cam 99 moves under the lower arm 124, will not reach and engage the upper contact thus permitting the relay 77 to remain closed and to effect continued running of the motor 74. In the event that a signature should fail to feed from a hopper or if the supply in one or more hoppers should become exhausted, the increase in pressure toward atmospheric which will occur in the suction header 13 due to the one or more uncovered sets of suction gripper grooves 58 of the rotors will cause the piston 117 to descend somewhat in the cylinder 112 so that the upper switch contact 128 is lowered to a point where it may be engaged by the lower contact 128 during the current cycle of rotation of the drive shaft and cam 99. This will permit completion of the circuit to the relay actuating coil 133 thus immediately opening the relay and stopping the drive motor 74. The arrangement is such that stoppage of the rotors 14 will occur in the movement thereof between positions wherein the signatures are gripped and released so that the operator will be immediately aware of which hopper the misfeed has occurred in or which hopper has exhausted its supply of signatures.

From the foregoing description of my invention it will be seen that I have provided mechanism of greatly simplified form over the structures of existing machines of this general char-

acter, which is capable of unfailingly delivering signatures at each cycle of operation, which is capable of being rapidly and easily adjusted to accommodate signatures of various sizes and surface textures and which is capable of increased production speed due to the exceptionally short travel path which is traversed by the signatures in their movement between the dispensing hoppers and the takeaway conveyor.

I claim:

1. In a gathering machine including support means for a stack of multi-sheet signatures to be dispensed cut edge foremost in a direction laterally of the stack and subadjacently spaced conveyor means movable past and for receiving a file of relatively spaced signatures dispensed from said stack, a cylindricform rotor journaled in axial parallelism with said conveyor and having a peripheral portion disposed in proximity to the bottom sheet of the lowermost signature of said stack, suction gripper means in said peripheral portion of the rotor, means for revolving said rotor in timed relation with movements of said conveyor means to move said suction gripper means below said lowermost signature and toward said conveyor means, a suction header connected with a source of sub-atmospheric pressure, a conduit interconnecting said suction header and suction gripper means whereby sub-atmospheric pressure may be communicated to said suction gripper means, a valve mounted for cyclic movement in said rotor and arranged to open and close said conduit so as to effect, respectively, cohesive engagement of the suction gripper means with said bottom sheet of a signature or release of said suction gripper means from said bottom sheet, said rotor when the suction gripper means thereof is in cohesive engagement with said bottom sheet of the signature drawing said lowermost signature of the stack bodily outwardly, the said bottom sheet thereof being directed curvately downward about the peripheral portion of the rotor while an upper sheet of the signature is free to move horizontally outwardly from the stack to thus open said signature, a cam cooperative with said valve to open the latter when said suction gripper means is positioned substantially below the foremost edge of the lowermost signature of the stack and to close said valve when said suction gripper means and the signature sheet in possession thereof approaches said conveyor means to release said opened signature and to permit movement of the latter into straddling engagement with said conveyor means, and means operative intermediate openings and closings of said valve for venting said suction header.

2. In a gathering machine including support means for a stack of multi-sheet signatures to be dispensed cut edge foremost in a direction laterally of the stack and subadjacently spaced conveyor means movable past and for receiving a file of relatively spaced signatures dispensed from said stack, a cylindricform rotor journaled in axial parallelism with said conveyor and having a peripheral portion disposed in proximity to the bottom sheet of the lowermost signature of said stack, suction gripper means in said peripheral portion of the rotor, means for revolving said rotor in timed relation with movements of said conveyor means to move said suction gripper means below said lowermost signature and toward said conveyor means, a suction header connected with a source of subatmospheric pressure, a conduit interconnecting said suction header and

suction gripper means whereby subatmospheric pressure may be communicated to said suction gripper means, a valve mounted for cyclic movement in said rotor and arranged to open and close said conduit so as to effect, respectively, cohesive engagement of the suction gripper means with said bottom sheet of a signature or release of said suction gripper means from said bottom sheet, said rotor when the suction gripper means thereof is in cohesive engagement with said bottom sheet of the signature drawing said lowermost signature of the stack bodily outwardly, the said bottom sheet thereof being directed curvately downward about the peripheral portion of the rotor while an upper sheet of the signature is free to move horizontally outwardly from the stack to thus open said signature, a cam fixed to said support means cooperative with said valve to open the latter when said suction gripper means is positioned substantially below the foremost edge of the lowermost signature of the stack and to close said valve when said suction gripper means and the signature sheet in possession thereof approaches said conveyor means to release said opened signature and to permit movement of the latter into straddling engagement with said conveyor means, means for moving said support means, the stack of signatures carried thereby and said cam unitarily about the axis of rotation of said rotor so as to shift the center of gravity of said stack relative to the lowermost signature, and means operative cyclically with rotations of said rotor and intermediate openings and closings of said valve for venting said suction header.

3. In a gathering machine including support means for a stack of multi-sheet signatures to be dispensed cut edge foremost in a direction laterally of the stack and subadjacently spaced conveyor means movable past and for receiving a file of relatively spaced signatures from said stack, a cylindricform rotor journaled in axial parallelism with said conveyor and having a peripheral portion disposed in proximity to the bottom sheet of the lowermost signature of said stack, and further having at least one groove in said peripheral portion extending across the latter in substantial parallelism with the rotational axis of the rotor, said rotor further having therein a suction duct in communication with said groove, means for revolving said rotor in timed relation with movements of said conveyor means to move said rotor peripheral groove below said lowermost signature and toward said conveyor means, a suction header connected with a source of sub-atmospheric pressure and with said suction duct of the rotor for communicating sub-atmospheric pressure to the rotor peripheral groove and for effecting adherence of the lowermost signature of the stack to the peripheral portion of the rotor as the said groove thereof is moved under said stack, a valve in said suction duct operative in timed relation with movements of said rotor to connect and disconnect said suction duct with and from said suction header, means normally urging said valve to disconnect said duct and header, a relief valve in said suction header capable of being opened to vent the suction header to the atmosphere, means interconnecting said rotor and relief valve for opening the latter in timed relation with openings and closings of said suction duct valve, and said lowermost signature of the stack being carried by said rotor toward said conveyor means and being released to engage the latter

upon closing of said suction duct valve and upon opening of said suction header relief valve.

4. In a gathering machine including support means for a vertically inclinable stack of multi-sheet signatures to be dispensed cut edge foremost in a direction laterally of the stack and subjacently spaced conveyor means movable past said stack for receiving a file of relatively spaced signatures dispensed from said stack, a tubular drive shaft journaled on said support means below said stack and in substantial axial parallelism with the path of movement of said conveyor means, a cylindricform rotor connected and rotatable with said drive shaft and having a peripheral portion arranged to move in an arcuate path below said stack in close proximity to the lowermost signature therein and toward said conveyor means, said rotor in the peripheral portion thereof having a surface recess extending laterally of said arcuate path and providing a suction gripper, said rotor further having therein a radially-extending suction gripper groove and said tubular drive shaft, a source of sub-atmospheric pressure connected with and to evacuate said drive shaft, rotor suction duct and suction gripper groove whereby when said rotor is moved along said arcuate path adherence of the lowermost signature of the stack thereof to the suction gripper will be effected and the said lowermost signature will be displaced laterally of the stack and moved toward said conveyor means, a valve in said rotor suction duct operable to open and close the latter in timed relation to movements of the rotor so as to effect, respectively, gripping and releasing of said lowermost signature by said suction gripper groove, bracket means journaled on said drive shaft and extending therefrom to engage said support whereby said stack may be moved bodily peripherally about the axis of said drive shaft so as to select vertical degrees of inclination of the stack, and means for securing said bracket means in a selected position.

5. In a gathering machine including support means for a vertically inclinable stack of multi-sheet signatures to be dispensed cut edge foremost in a direction laterally of the stack and subjacently spaced conveyor means movable past said stack for receiving a file of relatively spaced signatures dispensed from said stack, a tubular drive shaft journaled on said support means below said stack and in substantial axial parallelism with the path of movement of said conveyor means, a cylindricform rotor connected and rotatable with said drive shaft and having a peripheral portion arranged to move in an arcuate path below said stack in close proximity to the lowermost signature therein and toward said conveyor means, said rotor in the peripheral portion thereof having a surface recess extending laterally of said arcuate path and providing a suction gripper, said rotor further having therein a radially-extending suction duct interconnecting said suction gripper groove and said tubular drive shaft, a source of sub-atmospheric pressure connected with and to evacuate said drive shaft, rotor suction duct and suction gripper groove whereby when said rotor is moved along said arcuate path adherence of the lowermost signature of the stack thereof to the suction gripper will be effected and the said lowermost signature will be displaced laterally of the stack and moved toward said conveyor means, a valve in said rotor suction duct operable to open and close the latter in timed relation to

movements of the rotor so as to effect, respectively, gripping and releasing of said lowermost signature by said suction gripper groove, bracket means journaled on said drive shaft and extending therefrom to engage said support whereby said stack may be moved bodily peripherally about the axis of said drive shaft so as to select vertical degrees of inclination of the stack, and a cam operatively connected with said bracket means and said rotor suction duct valve to open the latter so as to grip a succeeding lowermost signature of the stack at a precise point adjacent the foremost cut edge thereof.

6. In a gathering machine including support means for a vertically inclinable stack of multi-sheet signatures to be dispensed cut edge foremost in a direction laterally of the stack and subjacently spaced conveyor means movable past said stack for receiving a file of relatively spaced signatures dispensed from said stack, a tubular drive shaft journaled on said support means below said stack and in substantial axial parallelism with the path of movement of said conveyor means, a cylindricform rotor connected and rotatable with said drive shaft and having a peripheral portion arranged to move in an arcuate path below said stack in close proximity to the lowermost signature therein and toward said conveyor means, said rotor in the peripheral portion thereof having a surface recess extending laterally of said arcuate path and providing a suction gripper, said rotor further having therein a radially-extending suction duct interconnecting said suction gripper groove and said tubular drive shaft, a source of sub-atmospheric pressure connected with and to evacuate said drive shaft, rotor suction duct and suction gripper groove whereby when said rotor is moved along said arcuate path adherence of the lowermost signature of the stack thereof to the suction gripper will be effected and the said lowermost signature will be displaced laterally of the stack and moved toward said conveyor means, a valve in said rotor suction duct operable to open and close the latter in timed relation to movements of the rotor so as to effect, respectively, gripping and releasing of said lowermost signature by said suction gripper groove, bracket means journaled on said drive shaft and extending therefrom to engage said support whereby said stack may be moved bodily peripherally about the axis of said drive shaft so as to select vertical degrees of inclination of the stack, a cam operatively connected with said bracket means and said rotor suction duct valve to open the latter so as to grip a succeeding lowermost signature of the stack at a precise point adjacent the foremost cut edge thereof, and means for securing said bracket means in a selected position of movement about the axis of said drive shaft so as to selectively vary the degree of vertical inclination of said stack and to vary the relative spacing between said conveyor means and said point at which said suction gripper groove grips a signature.

7. In a gathering machine including support means for a vertically inclinable stack of multi-sheet signatures to be dispensed cut edge foremost in a direction laterally of the stack and subjacently spaced conveyor means movable past said stack for receiving a file of relatively spaced signatures dispensed from said stack, a tubular drive shaft journaled on said support means below said stack and in substantial axial parallelism with the path of movement of said con-

veyor means, a cylindric rotor connected and rotatable with said drive shaft and having a peripheral portion arranged to move in an arcuate path below said stack in close proximity to the lowermost signature therein and toward said conveyor means, said rotor in the peripheral portion thereof having a surface recess extending laterally of said arcuate path and providing a suction gripper, said rotor further having therein a radially-extending suction duct interconnecting said suction gripper groove and said tubular drive shaft, a source of sub-atmospheric pressure connected with and to evacuate said drive shaft, rotor suction duct and suction gripper groove whereby when said rotor is moved along said arcuate path adhenence of the lowermost signature of the stack thereof to the suction gripper will be effected and the said lowermost signature will be displaced laterally of the stack and moved toward said conveyor means, a valve in said rotor suction duct operable to open and close the latter in timed relation to movements of the rotor so as to effect, respectively, gripping and releasing of said lowermost signature by said suction gripper groove, drive means

for rotating said drive shaft and rotor, and means interconnecting said suction header and drive means and operative in the absence of a signature in possession of said suction gripper groove as the latter moves between said stack and conveyor means for inactivating said drive means.

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