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C. E. CHRISTOPHEL

PAPER FEEDING MACHINE

Filed March 26, 1923

4 Sheets-Sheet 1

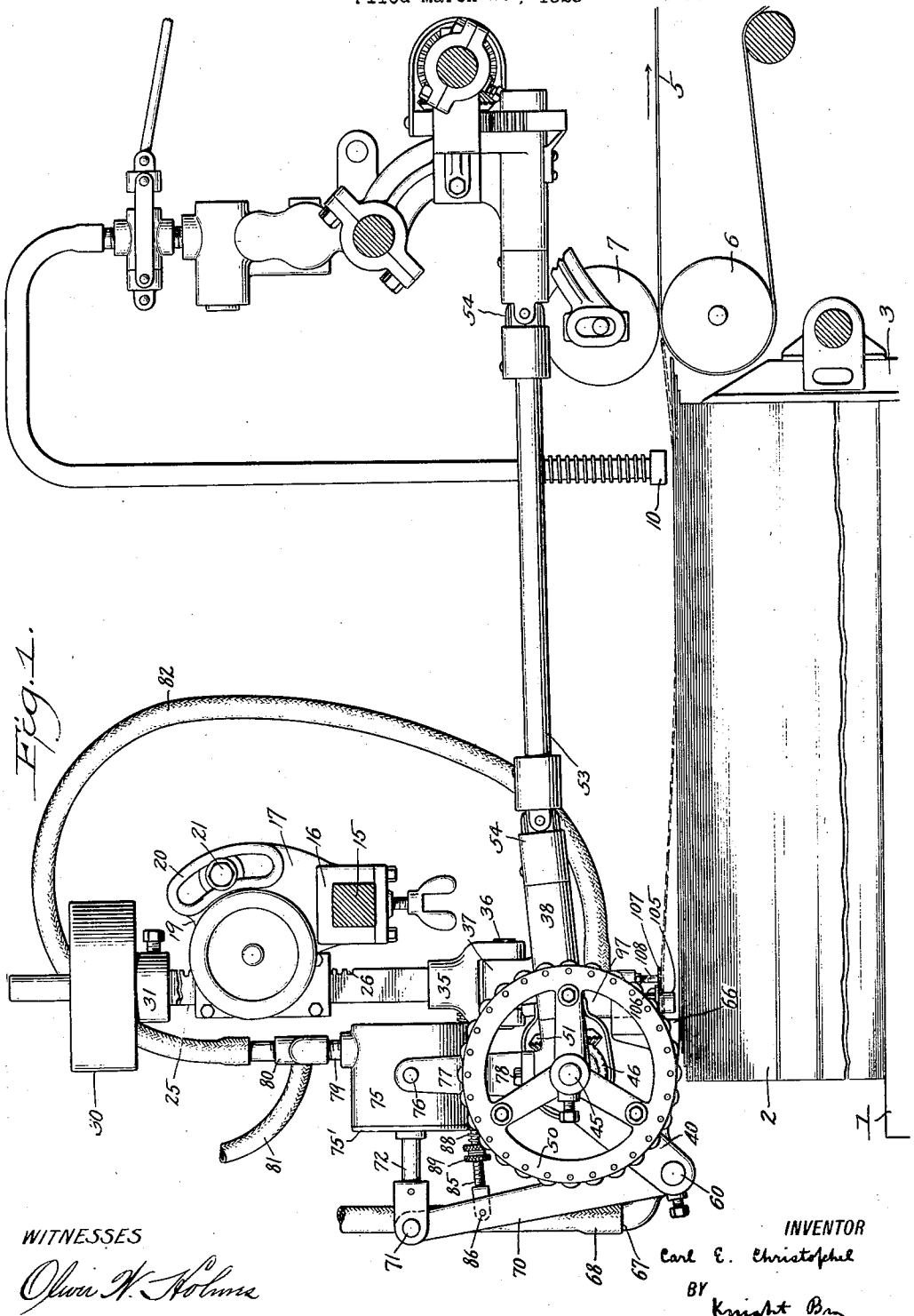


Fig. 1.

WITNESSES

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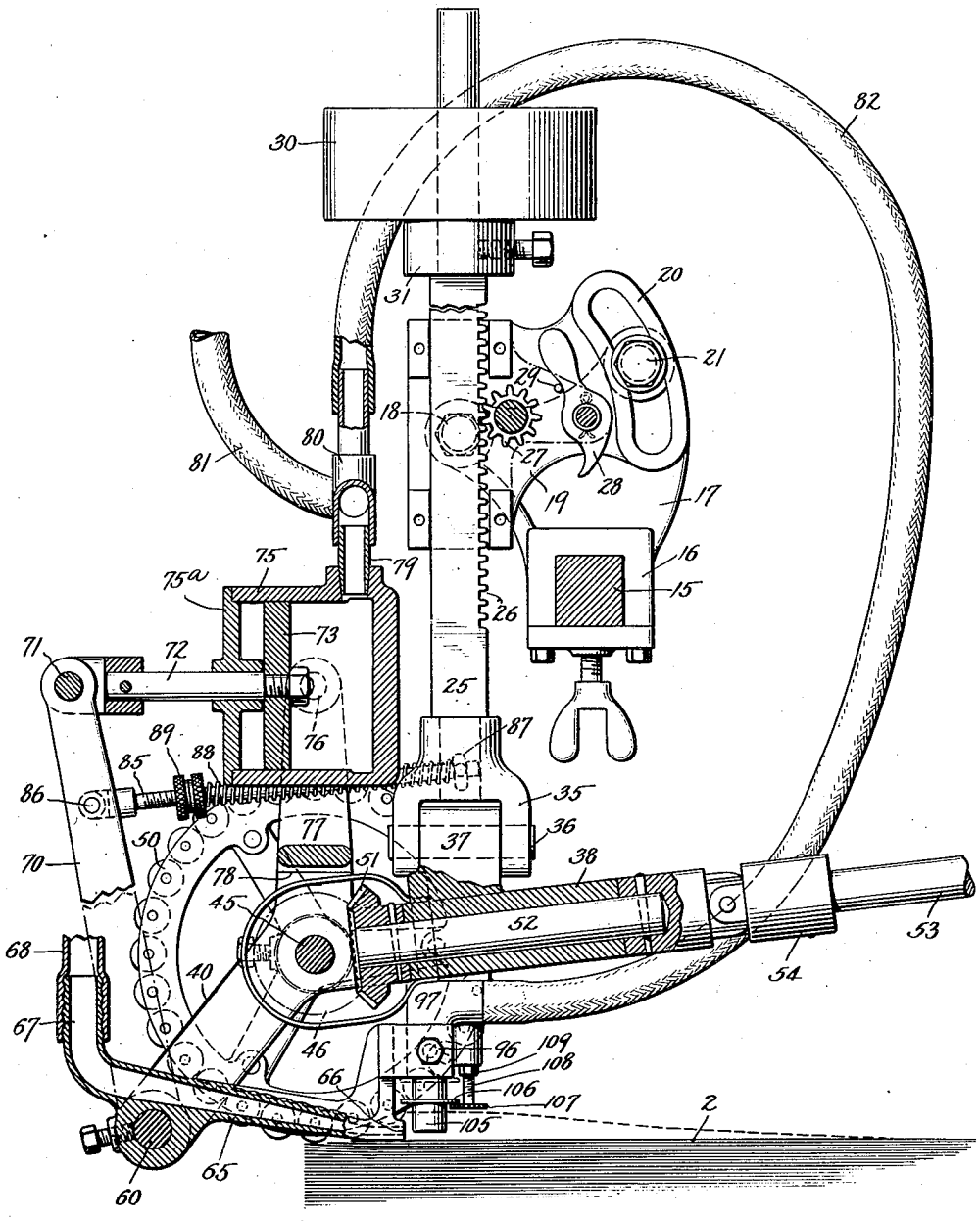
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Filed March 26, 1923 4 Sheets-Sheet 2

Fig. 2.



WITNESSES

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Filed March 26, 1923 4 Sheets-Sheet 3

Fig. 3.

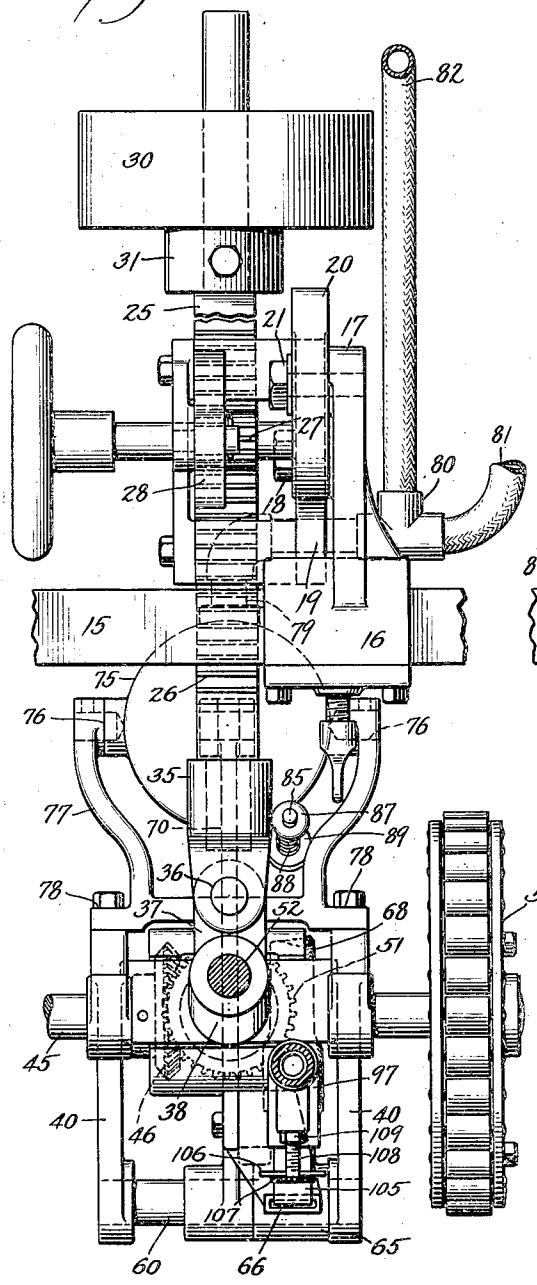
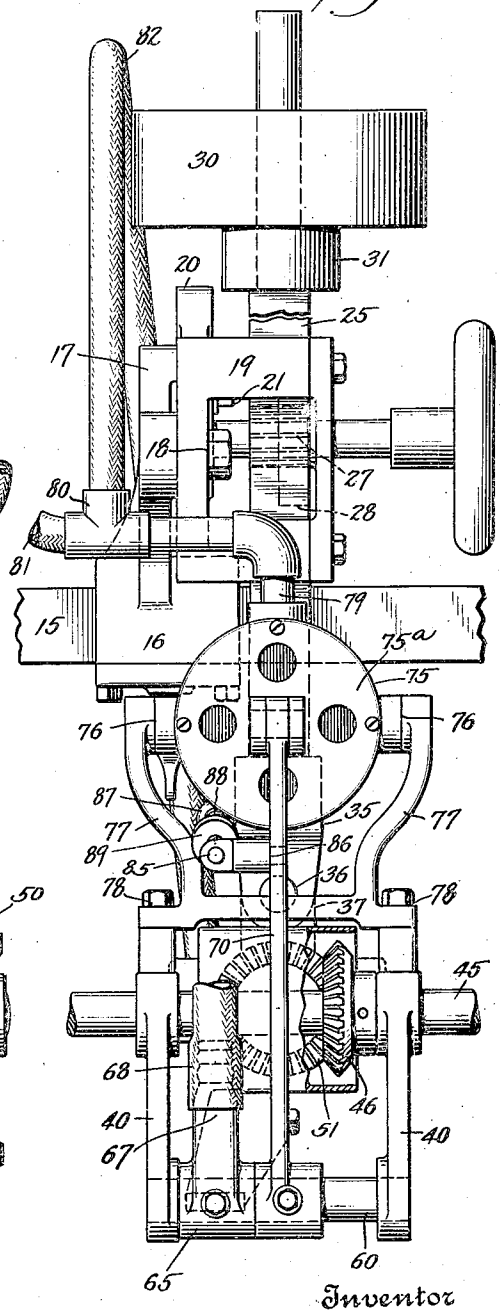


Fig. 4.



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Filed March 26, 1923 4 Sheets-Sheet 4

Fig. 5.

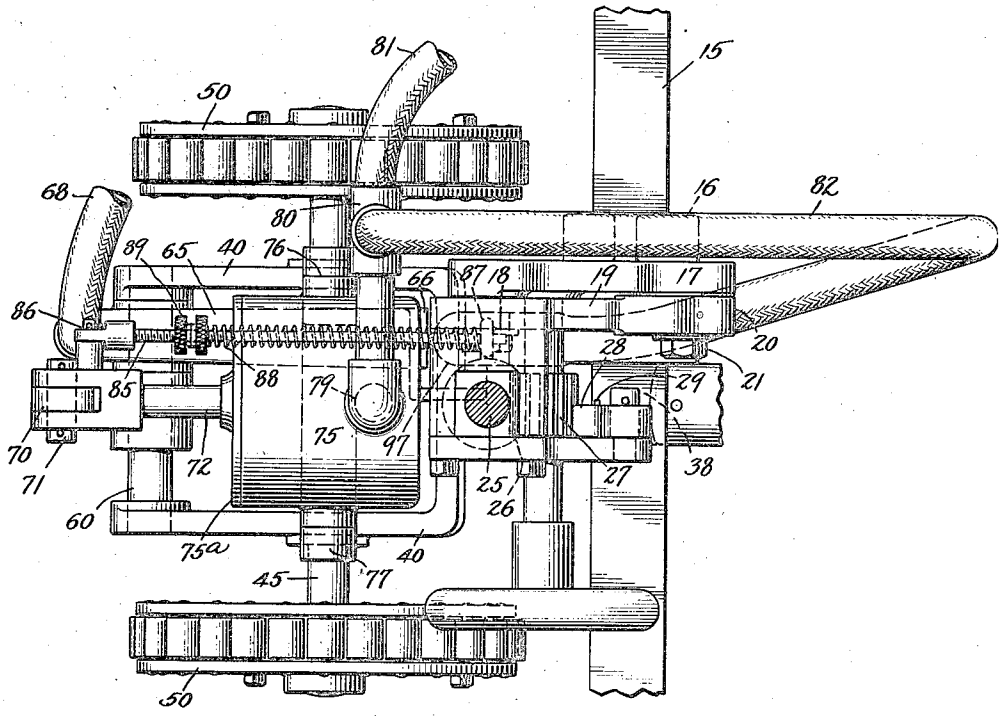
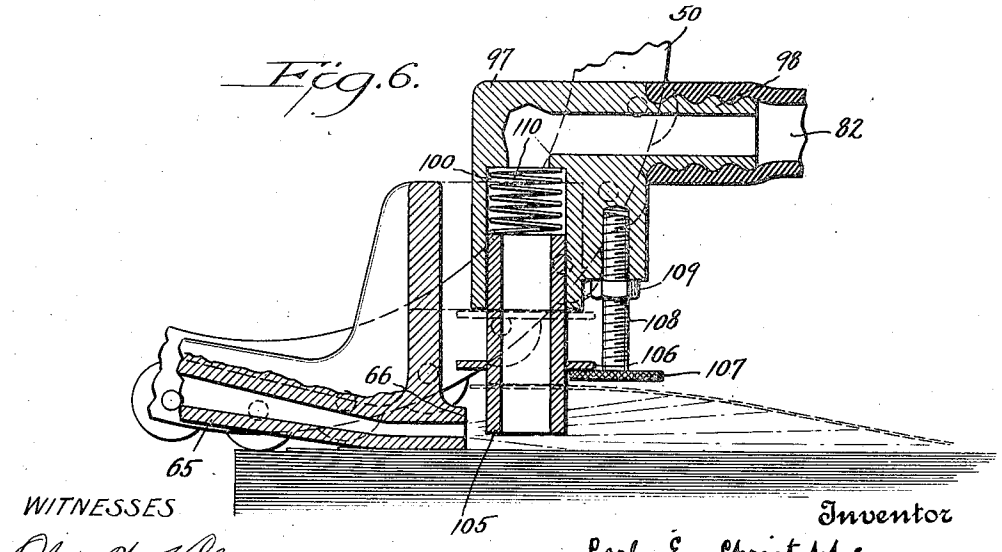


Fig. 6.



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UNITED STATES PATENT OFFICE.

CARL E. CHRISTOPHEL, OF PEARL RIVER, NEW YORK, ASSIGNOR TO DEXTER FOLDER COMPANY, OF PEARL RIVER, NEW YORK, A CORPORATION OF NEW YORK.

PAPER-FEEDING MACHINE.

Application filed March 26, 1923. Serial No. 627,80'

The present invention relates to means for separating and feeding successive sheets from an automatically elevated pile and particularly to the type of such machines in which the sheets are preliminarily separated by a combing action preparatory to the engagement of suitable feeding-off devices.

The present invention comprises a sheet combing separating device mounted upon a vertically yielding frame above the rear edge of a pile of sheets, the frame also carrying a pile engaging clamp adapted to engage the rear edge of the pile for holding the pile and raising the combing device out of action. The frame also carries a pneumatic cylinder in which operates a piston suitably connected with the pile engaging clamp, a sheet actuated controlling nozzle being in communication with the pneumatic cylinder for determining its action. The controlling nozzle is mounted adjacent to the combing device and holding foot, so that in the combing action the rear edge of the sheet moving from beneath the holding foot will be engaged and raised by the controlling nozzle and the suction in the pneumatic cylinder thrown into action for applying pressure to the clamp to cause the combing device to be raised out of action. The clamp is preferably in the form of a blower tube so as to direct a blast of air beneath the raised rear edge of the sheet.

In order that the invention may be fully understood it will first be described with reference to the accompanying drawings and afterwards pointed out more particularly in the annexed claims.

In said drawings:

Fig. 1 is a detail vertical longitudinal sectional elevation of a sheet feeding machine embodying the present invention.

Fig. 2 is a vertical longitudinal sectional view of the improved mechanism on a larger scale.

Fig. 3 is a front elevation of the same.

Fig. 4 is a rear elevation of the same.

Fig. 5 is a plan view of the same.

Fig. 6 is an enlarged detail sectional view of parts of the pile holding clamp and controlling nozzle.

1 represents an automatically controlled vertically movable table supporting a pile of sheets with their forward edges against the usual vertical piling guides 3.

5 indicates delivery tapes passing around lower delivery roller 6 and 7 are the ordinary intermittently acting drop rollers for taking successive sheets from the pile 2 as they are separated and fed from the pile.

10 indicates one of a pair of suction grippers that move vertically and horizontally with reference to the pile 2 to raise its successive sheets at their forward ends and move them from the pile into the bite of the delivery roller 6, 7 referred to. These suction grippers 10 may be operated and controlled by any suitable mechanism, such for instance as set forth in my pending application, Serial No. 484,384, filed July 13th, 1921. The feed-off and delivery mechanisms form no part of the present invention, except as elements in a broad sense of a complete machine.

Adjustably mounted above the pile of sheets adjacent to the rear edge is a transverse supporting bar 15 upon which is adjustably secured a yoke 16 carrying an upwardly projecting flange or bracket 17, to which is pivoted at 18 an adjustable yoke 19 formed with a slotted web 20 through which passes a set screw 21 carried by the web 17. By this means the yoke 19 can be adjusted upon pivot 18 to throw the separating mechanism forwardly or backwardly with reference to the rear of the pile of sheets as will hereinafter appear.

A supporting bar 25 passes vertically through the yoke 19 in which it freely moves. This bar 25 is formed upon one face with rack teeth 26 which mesh with a freely journalled pinion 27 carried by the yoke 19 and adapted to be engaged by a gravity dog 28 also pivoted upon yoke 19. The dog 28 is thrown into engagement with pinion 27 when it is desired to support the bar 25 and the mechanism carried by it in its raised position. Normally the weighted end of dog 28 rests against a pin 29 when the dog is out of action.

The bar 25 carries upon its upper end a gravity weight 30 which rests upon a collar 31 to give the bar 25 a normal tendency to move downwardly, holding the separating mechanism in operative relation to the pile of sheets.

The bar 25 carries upon its lower end a fork 35 in which is swivelled at 36 the upwardly presented lug 37 of a laterally ad-

justable frame carrying the separating devices. This separating frame comprises a rearwardly presented U-shaped yoke 40 formed integral with the pivot lug 37 and a cylindrical bearing sleeve 38.

A comber shaft 45 is journalled in the arms of yoke 40 and carries upon its opposite ends the comb wheels 50 of ordinary construction. The shaft 45 carries between its ends a beveled gear 46 meshing with and driven by a similar gear 51 secured to the rear end of a short shaft 52 journalled in the bearing sleeve 38 above referred to. The shaft section 52 is connected through shaft 53 and universal joint couplings 54 with suitable driving mechanism, such as illustrated in Fig. 1, for continuously rotating the comb wheels 50.

Freely journalled in the rearwardly projecting arms of the yoke 40 is a short rock shaft 60 upon which is adjustably secured an angular tubular pile holding clamp 65 having an air blast nozzle 66 and a heel or nipple 67, to which is attached a flexible air blast tube 68 leading from any suitable blower. The pile holding clamp 65 extends forwardly from shaft 60 to engage the rear of a pile of sheets between the separating combing wheels 50. Secured to the shaft 60 alongside of the clamp 65 is an upwardly projecting arm 70 connected at its upper end 71 with the piston rod 72 projecting from the piston 73, which operates in a pneumatic cylinder 75 pivotally mounted at 76 in the upwardly presented yoke 77 secured at 78 to the yoke frame 40 above referred to. The cylinder 75 has a removable perforated head 75a through which piston rod 72 operates, the perforations allowing the piston 73 to move freely inwardly in the cylinder when the air is exhausted from behind the piston. An air exhausting nipple 79 communicating with the cylinder 75 connects with a T-shaped coupling 80 connecting through one branch with a suction or air exhaustion pipe 81 leading from any suitable suction reservoir or pump and through another branch with a vacuum controlling pipe 82 leading from a sheet actuated controlling nipple hereinafter referred to.

The clamp operating arm 70 has a spring actuated rod 85 pivoted to it at 86, said rod passing forwardly through a guide loop 87 carried by the lower end of the supporting bar 25. An expansion spring 88 surrounds rod 85 and is confined between guide 87 and adjustable nut 89 threaded upon rod 85. It will be observed that the movement of piston 73 in cylinder 75 tends to force the clamp 65 against the pile, while the spring 88 tends to raise the clamp away from the pile.

The forward end of the clamp 65 is formed with an upwardly and forwardly presented bracket 95 to which is secured at 96 an angular tubular housing 97 formed with a nipple 98 to which the flexible tube 82 above referred to is attached. The housing 97 has a downwardly presented cylindrical recess 100 in which is freely mounted the vertically reciprocating tubular piston or controlling member 105. This piston 105 is formed with an annular collar 106 which in the lowered position of the piston rests upon the knurled head 107 of the adjustable stop screw 108 threaded into a suitable opening formed in the member 97. Lock nut 109 upon screw 108 secures the screw in the desired adjusted position. The limiting collar 106 engages the lower face of member 97 to limit the upward or inward movement of the piston. An expansion spring 110 is confined in the chamber 100 between the tubular piston 105 and the inner end of chamber 100.

The control of the air blast pipe communicating with clamp 65 and suction pipe 81 in communication with cylinder 75 and controlling nozzle or piston 105 may be through any suitable valve mechanism, such for instance as set forth in my above named application Serial No. 484,384. This particular controlling mechanism is immaterial to the scope of the present invention. Either by the continual application of air blasts and suction through said respective tubes, or by the periodic application of blasts and suction, the improved separating mechanism will operate for separating the successive sheets at the rear in combination with suitable feed-off delivery mechanisms such as above described.

It will be understood that the improved separating mechanism should be adjusted to approximately the center of the rear of the pile of sheets, so that the combing wheels will engage the pile just above the rear edge with the pile holding clamp projecting slightly forward of the line of contact of the combing wheels. The position of operation laterally and forward and back with reference to the rear edge of the pile is determined by the manual adjustments above described. In case of the presence of irregularities in the top surface of the pile at the rear edge, the frame supporting the combing wheels will automatically adjust itself so as to properly present the combing wheels in engagement with the pile. The combing wheels are continuously rotated and while in contact with the pile will gradually comb or fan the upper sheets of the pile forwardly from the rear edge as indicated in the drawings. The combing operation continues until the rear edge of the top sheet passes from beneath the holding clamp 65 at which moment the suction through controlling piston 105 will attract the released edge of the top sheet and cause it to adhere to the nozzle or piston 105,

thereby shutting off the entrance of air to the piston and causing the suction through pipe 82 to raise the piston 105 in the housing 97 as indicated by dotted lines in Fig. 6. As the top sheet is raised at its rear edge in this manner the air blast through the hollow clamp 65 is directed beneath the top sheet to assist in separating it from the pile. The cutting off of air through piston 105 to tube 82 causes the suction in pipe 81 to exhaust air from the cylinder 75, with the result that the piston 73 is moved inwardly to force clamp 65 downwardly against the pile with the result that the comb wheels will be thereby lifted up from the pile and their combing action arrested. This action is permitted because the frame upon which the parts are mounted is supported from the lower end of bar 25, which is held only by gravity in its lowered position and is, therefore, free to rise slightly through its guide yoke when the clamp is forced against the pile.

Immediately following this separating and pile combing action, the sheet forwarding devices 10 above referred to, move the top sheet forwardly into the bite of the delivery rollers 6, 7, which in their timed action deliver the sheet from the pile. As the sheet is moved forwardly from the pile its raised rear edge held by the piston 105 is pulled off of the polished end of the piston, thereby permitting air to enter the piston and break the suction in cylinder 75 to allow spring 88 to raise clamp 65 away from the pile and permit the combing wheels to again drop into action. As the sheet is pulled off of the controlling piston 105 the spring 110 forces the piston downwardly toward the top of the pile in readiness for the next operation.

I claim:

1. In a machine of the character described, the combination with a support for sheets, of a sheet moving instrument movable toward and away from said support, a holding clamp, and automatic means becoming effective when the edge of a sheet passes from beneath said clamp for elevating the sheet moving instrument and applying holding pressure to said clamp.

2. In a machine of the character described, the combination with a support for a pile of sheets, and means for delivering sheets from the pile, of a sheet moving instrument movable toward and away from the pile, a pile holding clamp, and automatic means becoming effective when the edge of a sheet passes from beneath said clamp for controlling the elevation of the sheet moving instrument and applying holding pressure to said clamp.

3. In a machine of the character described, the combination with a support for sheets, and sheet delivery means, of a sheet combing instrument movable into and out of engagement with sheets upon said support, a holding clamp, and automatic means becoming effective when the edge of a sheet passes from beneath said clamp for moving the combing instrument out of engagement with said sheets and applying holding pressure to said clamp.

4. In a machine of the character described, the combination with a support for a pile of sheets, of a vertically movable sheet combing instrument operating above one edge of the pile, a pile holding clamp operating upon the edge of the pile adjacent to said combing instrument, and automatic means becoming effective when the edge of a sheet passes from beneath said clamp for controlling the elevation of the combing instrument and applying holding pressure to said clamp.

5. In a machine of the character described, the combination with a support for sheets, of a sheet moving instrument movable toward and away from said support, a holding clamp, pneumatic means for applying holding pressure to said clamp, and automatic means becoming effective when the edge of a sheet passes from beneath said clamp for controlling said pneumatic means.

6. In a machine of the character described, the combination with a support for sheets, of a sheet moving instrument movable toward and away from said support, a holding clamp, a suction device for applying holding pressure to said clamp, and a suction relief communicating with said suction device and arranged adjacent to said clamp to be sealed by the edge of a sheet passing from beneath said clamp to cause the application of holding pressure thereto.

7. In a machine of the character described, the combination with a support for a pile of sheets, of a sheet moving instrument, a pile holding clamp, means for raising said sheet moving instrument away from the pile and for applying holding pressure to said clamp, and a controlling device arranged adjacent to said clamp becoming effective when the edge of a sheet passes from beneath said clamp to cause the operation of said instrument raising and pressure applying means.

8. In a machine of the character described, the combination with a support for a pile of sheets, of a sheet moving combing instrument operating above one edge of the pile of sheets, a pile holding clamp operating upon the edge of the pile adjacent to said combing instrument, means for raising the combing instrument away from the pile and for applying holding pressure to the clamp, and a controlling device arranged adjacent to said clamp and becoming effective when by the edge of the sheet passes

from beneath said clamp to cause the operation of said instrument raising and pressure applying means.

9. In a machine of the character described, the combination with a support for a pile of sheets, of a sheet moving instrument, a pile holding clamp, pneumatic means arranged to raise the sheet moving instrument away from the pile and to simultaneously apply holding pressure to said clamp, and a normally open pneumatic controlling device in communication with said pneumatic means adapted to be closed by a sheet passing from beneath said clamp to cause said pneumatic means to raise the sheet moving instrument and apply pressure to the clamp.

10. In a machine of the character described, the combination with a support for a pile of sheets, and means for delivering sheets from the pile, of a sheet moving combing instrument, a pile holding clamp, pneumatic means for raising the combing instrument away from the pile and for applying holding pressure to the clamp, and a controlling device arranged adjacent to said clamp and adapted to be actuated by the edge of the sheet passing from beneath said clamp to cause the operation of said instrument raising and pressure applying means.

11. In a machine of the character described, the combination with a support for a pile of sheets, and means for delivering sheets from said pile, of a sheet moving combing instrument, a pile holding clamp, pneumatic means arranged to raise the combing instrument away from the pile and to simultaneously apply holding pressure to said clamp, and a normally open pneumatic controlling device adjacent to said clamp in communication with said pneumatic means adapted to be closed by the edge of a sheet passing from beneath said clamp to cause said pneumatic means to raise the combing instrument and apply pressure to the clamp.

12. In a machine of the character described, the combination with a support for sheets, of a sheet moving combing device, a pile holding clamp, pneumatic means arranged to raise the comber away from the pile and apply holding pressure to said clamp, a pneumatic controlling device in communication with said pneumatic means comprising a tubular housing and a normally open suction tube operating in said housing and adapted to be closed by a sheet.

13. In a machine of the character described, the combination with a support for sheets, of a sheet moving combing device, a pile holding clamp, pneumatic means arranged to raise the comber away from the pile and simultaneously apply holding pressure to said clamp, a pneumatic controlling device in communication with said pneumatic means comprising a tubular housing and a normally lowered open suction tube movably mounted in said housing and adapted to engage and be closed by a sheet and raise with the sheet and cause the operation of said pneumatic means.

14. In a machine of the character described, the combination with a support for sheets, and means for delivering sheets therefrom, of a sheet moving combing device, a pile holding clamp, pneumatic means arranged to raise the comber away from the pile and simultaneously apply holding pressure to said clamp, a pneumatic controlling device in communication with said pneumatic means comprising a tubular housing and normally lowered open suction tube operating as a piston in said housing and adapted to engage and be closed by the edge of a sheet passing from beneath said clamp and raise with the sheet and cause the operation of said pneumatic means.

15. In a machine of the character described, the combination with a support for a pile of sheets, of a sheet moving combing device movable toward and from the pile, a pile engaging clamp, pneumatic means for raising said combing device and applying holding pressure to said clamp, a tubular housing mounted upon said clamp and communicating with said pneumatic means, and a normally open tubular piston operating in said housing adapted to engage and be closed by the rear edge of a sheet passing from beneath said clamp to cause the elevation of the suction piston and attached sheet and the operation of said pneumatic means.

16. In a machine of the character described, the combination with a support for a pile of sheets, and means for delivering sheets from said pile, of a sheet moving combing device movable toward and from the pile, a pile engaging clamp, pneumatic means for raising said combing device and applying holding pressure to said clamp, a tubular housing mounted upon said clamp and communicating with said pneumatic means, and a normally open tubular piston operating in said housing adapted to engage and be closed by the rear edge of a sheet passing from beneath said clamp to cause the elevation of the suction piston and attached sheet and the operation of said pneumatic means.

17. In a machine of the character described, the combination with a support for a pile of sheets, of a sheet moving combing device operating above the rear edge of sheets upon said support and movable toward and from the pile, a pile engaging clamp, pneumatic means for raising said

combing device, a tubular housing mounted adjacent to said combing device and communicating with said pneumatic means, and a normally open tubular piston operating in said housing adapted to engage and be closed by the rear edge of a sheet passing from beneath said clamp to cause the elevation of the suction piston and attached sheet and the operation of said pneumatic means.

18. In a machine of the character described, the combination with a pile support, of a sheet separating comber operating above the rear edge of sheets upon said support, pneumatic means for raising said comber from the sheets, and a pneumatic control actuated by the rear edge of the top sheet to cause the comber to be raised when the sheet reaches the desired position.

19. In a machine of the character described, the combination with a pile support, of a sheet separating comber operating above the rear edge of sheets upon said support, pneumatic means for raising said comber from the sheets, a pneumatic control actuated by the rear of the top sheet to cause the comber to be raised when the top sheet reaches the desired position, and an automatically operated pile holding clamp.

20. In a machine of the character described, the combination with a pile support, of a sheet separating comber operating above the rear edge of sheets upon said support, a pneumatically operated pile holding clamp operating upon the rear edge of the sheets, pneumatic means for raising said comber from the sheets, and a pneumatic control actuated by the rear of the top sheet to cause the comber to be raised.

21. In a machine of the character described, the combination with a sheet support, of a sheet separating member, a pile holding clamp acting upon the rear edge of the sheets, and automatically controlled pneumatic means becoming effective when the edge of a sheet passes from beneath said clamp for raising said separating member and actuating said clamp.

22. In a machine of the character described, the combination with a sheet support, and sheet delivering means, of a sheet separating combing device operating upon the rear edge of the pile of sheets, a pile holding clamp acting upon the rear edge of the sheets, and automatically controlled pneumatic means becoming effective when the edge of a sheet passes from beneath said clamp for simultaneously raising said separating member and actuating said clamp.

23. In a machine of the character described, the combination with a pile support, of a sheet moving combing device operating above the rear of the pile of sheets upon said support, a pile holding clamp operating above the rear edge of the pile, a suction member mounted adjacent to said clamp and adapted to elevate the rear edge of a sheet as it passes from beneath said clamp, and means controlled by the action of said suction member for raising said combing device and applying holding pressure to said clamp.

24. In a machine of the character described, the combination with a pile support, of a sheet moving device operating above the rear of the pile of sheets upon said support, a pile holding clamp operating above the rear edge of the pile, a suction member mounted adjacent to said clamp and adapted to elevate the rear edge of a sheet as it passes from beneath said clamp, said suction member comprising a housing, an open tubular piston movably mounted in said housing, adjustable means for limiting the movement of said tubular piston, and means controlled by said suction member for raising said sheet moving device and applying holding pressure to said clamp.

25. In a machine of the character described, the combination with a pile support, of a sheet moving device operating above the rear of the pile of sheets upon said support, a pile holding clamp operating above the rear edge of the pile, a suction member mounted adjacent to said clamp and adapted to elevate the rear edge of a sheet as it passes from beneath said clamp, said suction member comprising a tubular housing, an open tubular piston operating in said housing, a spring normally forcing said tubular piston downwardly in its housing, and means controlled by said suction member for raising said sheet moving device and applying pressure to said clamp.

26. In a machine of the character described, the combination with a pile support, of a sheet moving device operating above the rear of the pile of sheets upon said support, a pile holding clamp operating above the rear edge of the pile, a suction member mounted adjacent to said clamp and adapted to elevate the rear edge of a sheet as it passes from beneath said clamp, said suction member comprising a tubular housing, an open tubular piston operating in said housing, a spring normally forcing said tubular piston downwardly in its housing, adjustable means for limiting the movement of said tubular piston, and means controlled by the action of said suction member for raising said sheet moving device and applying holding pressure to said clamp.

27. In a machine of the character described, the combination with a pile support, of a sheet moving device operating above the rear of the pile of sheets upon said support, a pile holding clamp operating above the rear edge of the pile, a suction member mounted adjacent to said clamp and adapted to elevate the rear edge

of a sheet as it passes from beneath said clamp, said suction member comprising a tubular housing, an open tubular piston operating in said housing, a spring normally forcing said tubular piston downwardly in its housing, a collar upon said tubular piston, an adjustable stop limiting the downward movement of said piston, and means controlled by the action of said suction member for raising said sheet moving device and applying holding pressure to said clamp.

28. In a machine of the character described, the combination with a pile support, of an upwardly yielding frame carrying a sheet moving member, a pile holding clamp mounted upon said frame, and automatically controlled pneumatic means arranged adjacent said clamp for forcing said clamp against the pile to raise said frame and sheet moving member away from the pile.

29. In a machine of the character described, the combination with a pile support, of an upwardly yielding gravity frame, a sheet moving member swivelled upon said frame, a pile holding clamp mounted upon said frame, and pneumatic means arranged adjacent said clamp and controlled by a sheet for forcing said clamp against the pile to raise said frame and sheet moving member away from the pile.

30. In a machine of the character described, the combination with a pile support, of an angularly adjustable bracket mounted above said support, a vertically yielding frame mounted in said bracket, a sheet moving member swivelled upon said frame, a pile holding clamp mounted upon said frame, and pneumatic means arranged adjacent said clamp and controlled by a sheet for forcing said clamp against the pile to raise said frame and sheet moving member away from the pile.

31. In a machine of the character described, the combination with a pile support, of a vertically yielding frame carrying a sheet moving member, a pile holding clamp mounted upon said frame, and automatically controlled pneumatic means becoming effective when the edge of a sheet passes from beneath said clamp for forcing said clamp against the pile to raise said frame and sheet moving member away from the pile.

32. In a machine of the character described, the combination with a support for a pile of sheets, of a vertically yielding frame, a sheet moving combing device mounted upon said frame, a pile engaging clamp movably mounted upon said frame, pneumatic means for forcing said clamp against the pile to raise said frame and combing device away from the pile, and a sheet actuated pneumatic controlling device for said pneumatic means becoming effective when the edge of a sheet passes from beneath said clamp.

33. In a machine of the character described, the combination with a support for a pile of sheets, of a vertically yielding frame, a sheet moving combing device mounted upon said frame, a pile engaging lever pivoted upon said frame, and means automatically controlled by the edge of a sheet passing from beneath said lever for forcing said lever into holding engagement with the pile to raise the frame and combing device away from the pile.

34. In a machine of the character described, the combination with a support for a pile of sheets, of a vertically yielding frame, a sheet moving combing device mounted upon said frame, a pile engaging lever pivoted upon said frame, a spring raising said lever away from said pile, and automatically controlled means forcing said lever into holding engagement with the pile to raise the frame and combing device away from the pile.

35. In a machine of the character described, the combination with a support for a pile of sheets, of a vertically yielding frame, a combing device mounted upon said frame, a pneumatic cylinder carried by said frame, a piston operating in said cylinder, a pile holding clamp movably mounted upon said frame, means connecting said piston with said clamp, and a controlling device for controlling the suction in said cylinder.

36. In a machine of the character described, the combination with a support for a pile of sheets, of a vertically movable supporting bar mounted above said support, a frame pivoted to swing laterally upon said supporting bar, a combing wheel journalled transversely in said frame, a pile holding clamp movably mounted upon said frame, and automatically controlled pneumatic means for forcing said clamp into engagement with the pile for raising said frame and combing wheel away from the pile said means becoming effective when the edge of a sheet passes from beneath said clamp.

37. In a machine of the character described, the combination with a support for a pile of sheets, of a vertically movable supporting bar mounted above said support, a frame pivoted to swing laterally upon said supporting bar, a power driven comber shaft journalled transversely in said frame, spaced combing wheels mounted upon said shaft, a pile holding clamp movably mounted upon said frame, and automatically controlled means for forcing said clamp into engagement with the pile for raising said frame and combers away from the pile.

38. In a machine of the character described, the combination with a support for

a pile of sheets, of a vertically movable supporting bar mounted above said support, a frame pivoted to swing laterally upon said supporting bar, a power driven comber shaft journalled transversely in said frame, spaced combing wheels mounted upon said shaft, a pile holding clamp pivotally mounted upon said frame, a pneumatic cylinder carried by said frame, a piston operating in said cylinder, means connecting said piston with said clamp, and a suction controlling device communicating with said piston.

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