June 4, 1929. C. W. HARROLD 1,715,358

SHEET SEPARATOR

Filed Oct. 1, 1927 2 Sheets-Sheet 1

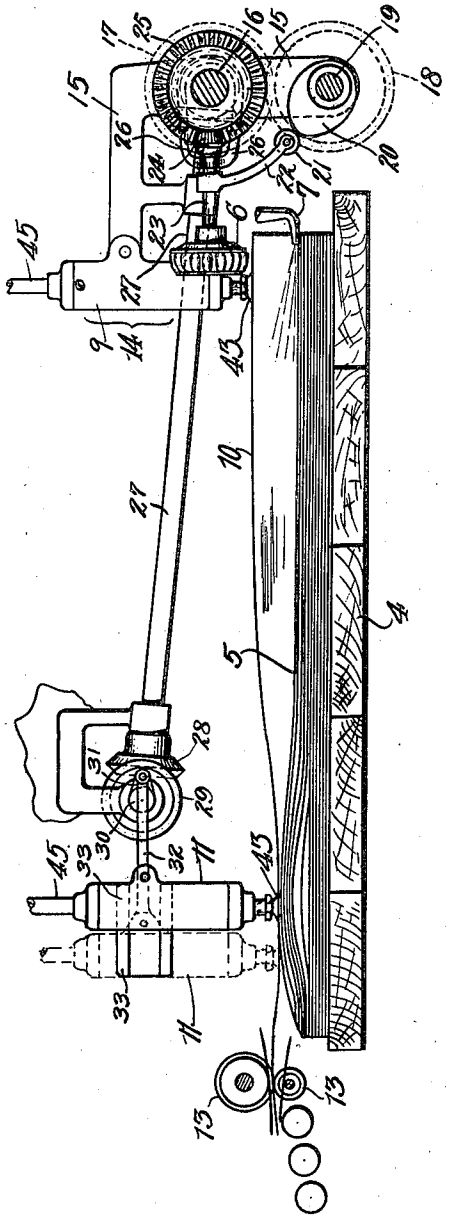


FIG. 1.

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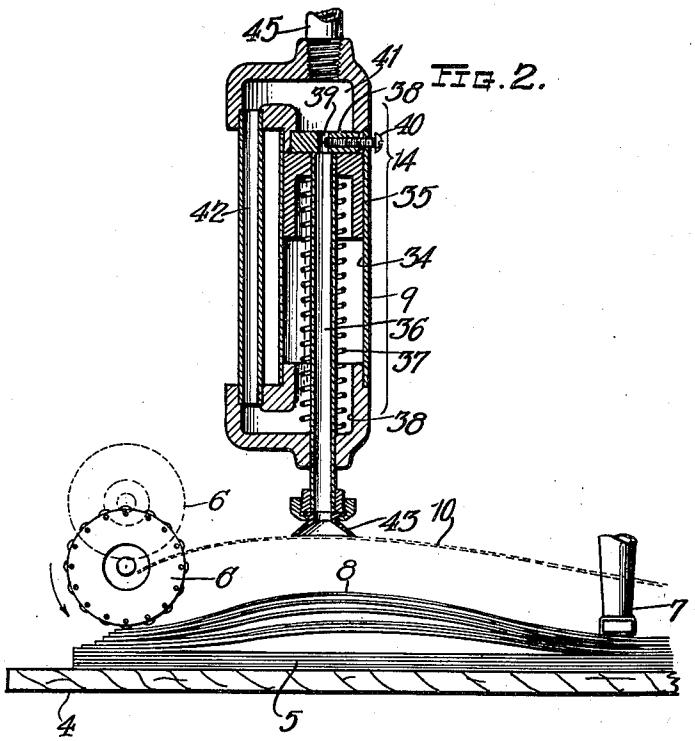


Fig. 2.

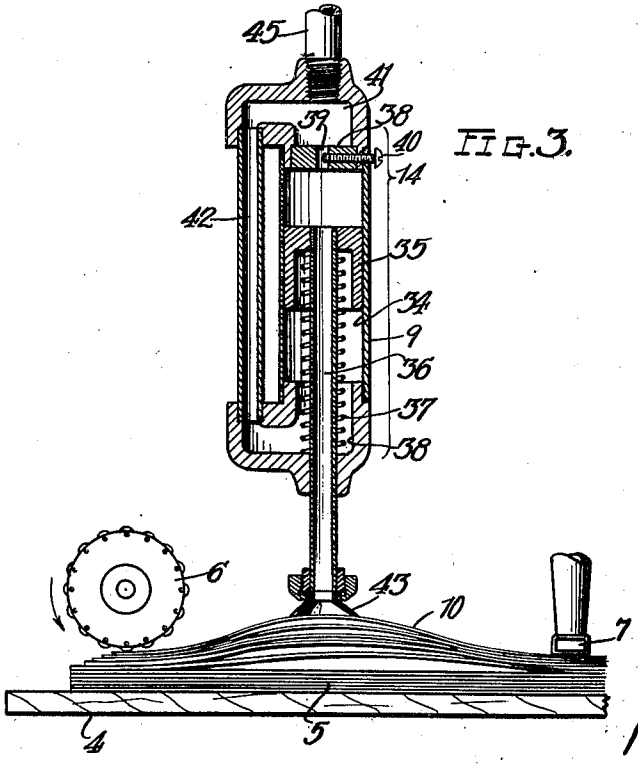


Fig. 3.

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Patented June 4, 1929. 1,715,358

UNITED STATES PATENT OFFICE.

CHARLES W. HARROLD, OF CLEVELAND, OHIO, ASSIGNOR TO HARRIS-SEYBOLD-POTTER COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF DELAWARE.

SHEET SEPARATOR.

Application filed October 1, 1927. Serial No. 223,309.

My invention relates to sheet separating mechanisms for automatic sheet-feeders, and more particularly to pneumatic suction sheet, separating devices especially adapted for use when embodied in the pile sheet-feeders of the type shown in the U. S. Charles G. Harris Patent No. 1,112,609 of October 6, 1914.

The objects of my invention are, among other things, to provide an improved telescopic suction separator which is adapted to seize and lift the successive top sheets from a pile or stack of paper, and then separate and advance each engaged sheet to the feed-rolls of the printing-press or other machine to which the sheet-feeder is attached. A further feature of my invention is to provide a novel form of telescopic suction separator of this type which will have a wide range of flexibility in picking up and removing the top sheets successively from piles of stock of varying heights whereby the separation of the individual sheets may be carried on with a high degree of accuracy, rapidity and general efficiency in action even when different grades and thicknesses of paper are used.

With these and other objects in view, my invention comprises the constructions and operating parts forming the improved suction separator herein shown and hereinafter to be described as a preferred embodiment of my invention which is also readily adapted to any form of suction sheet-feeder and is not to be restricted to the type shown in the C. G. Harris Patent No. 1,112,609 issued as aforesaid.

In the drawings, Fig. 1 is a side elevation in more or less diagrammatic form of a feed-table upon which rests a pile or stack of paper, and above the pile are illustrated the sheet-buckling and separating units such as are embodied in the Harris feeder:

Fig. 2 is a sectional elevation of the sucker head in a separating unit when the sucker is elevated to raise the top sheet (shown in dotted lines) from the pile; and

Fig. 3 is a view similar to Fig. 2, but showing the sucker in midway position, and as having gripped the top sheet from the bulged or buckled portion of the stock between the combing buckler and presser-foot.

Similar numerals refer to similar parts throughout the several figures.

Referring to the figures, the feed-table 4 supports the pile or stack of paper 5 and at each of the rear corners of the pile 5 is located the combing buckler wheel 6 which is rotated to frictionally engage the top portion of the pile (Figs. 2 and 3), so as to produce a series of traveling arcs or buckles in the topmost and subjacent sheets of the pile 5, the paper being held against movement by the adjacent presser-foot 7. While the bulged portion 8 (Fig. 3) is so held by the combing buckler 6 and presser-foot 7, the suction separator 9 is lowered by suction to seize the topmost sheet 10 and then is raised with the sheet 10, after which the combing wheel 6 is lifted to the dotted line position shown in Fig. 2, and the presser foot 7 is thrown outwardly and then inwardly to again engage the pile 5 beneath the top sheet 10, and simultaneously blasts of air are projected from the presser-foot 7 as shown in Fig. 1 whereby the top sheet 10 is "winded" from the pile 5, and, while held by the suction separator 9, is caused to float or flutter out of contact with such pile. Then the suction carriers 11 (only one being shown in Fig. 1) seize the top sheet 10 and by a horizontal advancing movement (indicated by dotted lines in Fig. 1) forward the leading edge of this separated top sheet between the feed-roll guides 12 into the bite of the rotating feed-rolls 13 which carry the succesive sheets to the press or other machine. The above cycle of operations in sheet separation and feeding is substantially the same as that described in the C. G. Harris Patent No. 1,112,609.

The suction separator 9 is carried in the sucker head 14 mounted on the L shaped frame 15 which carries the drive shaft 16. Mounted on the shaft 16 is the gear 17 (shown in dotted lines in Fig. 1) which engages the gear 18 mounted to the stub-shaft 19 journalled in the lower end of the frame 15. The shaft 19 carries the cam 20 which engages the roller 21 pinned to the pendent arm 22 journalled to the combing-wheel shaft 23, whereby the combing wheel 6 may be raised and lowered from and to the pile 5 in each cycle. The shaft 23 is rotated by means of the pinion 24 which engages the gear 25 fastened to the shaft 16, and the shaft 23 is also mounted in the bracket arms 26 by which the combing wheel 6 may be swung out of engagement with the topmost sheet 10 when gripped by the separator 9.

At the far end of the shaft 16 is a set of gears (not shown) which rotate the shaft 27 and the coacting bevel gears 28 and 29, the

gear 29 being fast to the stub-shaft 30 journalled in the brackets 31 (Fig. 1). The shaft 30 carries the crank-arm 31 connected by the link 32 to the suction carrier head 33 which supports the suction carrier 11. The rotation of the crank-arm 31 through gears 28 and 29 and the shaft 27 imparts a horizontal reciprocating movement to the suction carriers 11 which advance the leading edge of the gripped top sheet 10 into the bite of the feed-rolls 13, all as shown in Fig. 1.

Referring more particularly to Figs. 2 and 3, the suction head 14 comprises the main cylinder 34 in which is reciprocated the piston 35 carrying the hollow piston rod or tube 36 which is encircled by the coil spring 37, the upper end of which spring bears against the piston 35 and the lower end against the bottom of the compartment 38 cut in the lower part of the head 14. The tension of the spring 37 normally tends to force the piston 35 to its raised position (Fig. 2) against the headplate 38 secured in the head 14 to form the top of the cylinder 34. Centrally formed in the headplate 38 is the small orifice or port 39 the size of which may be regulated or controlled by the adjusting screw 40. The upper compartment 41 formed in the top portion of the head 14 is connected to the lower compartment 38 through which slides the tube 36 by the by-pass cylinder 42 which is of greater diameter than the port 39. The lower end of the tube 36 is provided with the usual rubber lipped sucker 43 secured to the tube 36 by the lock-nut 44, which sucker 43 is adapted to be closed by and to grip a sheet as shown in Figs. 2 and 3. The upper compartment 41 is connected by the pipe 45 with an air-exhausting device (not shown), which creates the suction or partial vacuum by which my improved telescopic sucker is operated. The necessary valves to properly intermit the suction are not shown as such means to control the suction in the compartment 41 are old.

The operation of my improved telescopic suction sheet-separating device which I have just described is substantially as follows: When the combing wheel 6 is revolving as shown in Fig. 3, the bulged portion of the stock between the combing wheel 6 and presser-foot 7 is loosened and partially aerated. The sucker 43 is opened to atmosphere and then as suction or exhaust pressure is applied to the compartment 41 through the pipe 45, the piston 35 is caused to move downwardly through the cylinder 34 against the force of the coil-spring 37. Since the by-pass cylinder 42 is considerably larger than the port 39 which connects the upper compartment 41 to the piston tube 36 a suction or partial vacuum is created in the cylinder 34 sufficiently strong to overcome the coil spring 37 so as to cause such downward movement of the piston 35 until the sucker 43 rests on the top sheet 10 (Fig. 3) thereby sealing the sucker 43 so that no air will pass upwardly through the piston tube 36. Immediately upon the covering or sealing of the sucker 43 by the top sheet 10, the suction or partial vacuum on both sides of the piston 35 becomes equalized and the force of the spring 37 (under compression when the piston 35 is lowered) raises the piston 35 and sucker 43 carrying the top sheet 10 with it as shown by dotted lines in Fig. 2. Thereafter the combing-wheel 6 is lowered to its full line position (Fig. 2), and then is revolved in a counterclockwise direction to form the buckled portion of stock as shown in Fig. 3 for the succeeding cycle in separating the next sheet.

The suction carrier 11 arranged in the head 33 is built and actuated in the same manner as the sucker 43 in the sucker head 14 in gripping the winded sheet (Fig. 1); after the sucker 43 has been raised, the suction carrier 11 is then moved to the left in Fig. 1 to carry the top sheet 10 to the bite of the feed-rolls 13 as shown and hereinbefore described.

While the foregoing sets forth one embodiment of my invention, many changes in the structural details may be made without departing from the principles and scope of the invention or sacrificing the chief advantages involved.

I claim as my invention:

1. A sheet-separator comprising a vacuum cylinder, a sheet-gripping sucker vertically movable in said cylinder, and resilient means placed under compression by the vacuum in said cylinder, but released by the sheet sealing said sucker for raising the sucker relatively to said cylinder.

2. A sheet-separator comprising a vacuum cylinder, a vacuum tube vertically movable in said cylinder, a sucker mounted on the outer end of said tube, and resilient means placed under compression by the vacuum in said cylinder, but released by the sheet sealing said sucker for raising said tube and sucker relatively to said cylinder.

3. A sheet-separator comprising a vacuum cylinder, a sheet-gripping sucker vertically movable in said cylinder, and a compressible spring released by the sheet sealing said sucker for raising the sucker relatively to said cylinder.

4. A sheet separator comprising a vacuum cylinder, a vacuum tube vertically movable in said cylinder, a sucker mounted on the outer end of said tube, and a compressible spring released by the sheet sealing said sucker for raising said tube and sucker relatively to said cylinder.

5. A sheet-separator comprising a vacuum cylinder, a sheet-gripping sucker vertically slidable in said cylinder, suction-actuated means for lowering said sucker in said cylinder to grip a sheet, and means controlled by the sheet sealing said sucker to raise the sucker with said gripped sheet.

6. A sheet-separator comprising a vacuum cylinder, a sheet-gripping sucker vertically slidable in said cylinder, suction-actuated means for lowering said sucker in said cylinder to grip a sheet, and a spring compressed by the lowering of the sucker but released by the sheet sealing said sucker to raise the sucker with said gripped sheet.

7. A sheet-separator comprising a vacuum cylinder, a vacuum tube mounted on a piston in said cylinder, a sucker mounted on the outer end of said tube, a port extending through one end of the cylinder through said piston to said vacuum tube, a by-pass suction connection of greater diameter than said port to the opposite side of said piston in said cylinder, compressible means normally forcing said piston in alinement connection with said port, and means for imparting a vacuum pressure on both sides of said piston to move the latter against the tension of said compressible means.

8. A sheet separator comprising a vacuum cylinder, a sheet-gripping sucker movable in said cylinder, compressible means raising said sucker when sealed by the sheet, and means actuated by suction in said cylinder for moving said sucker in the opposite direction and placing said compressible means under compression.

9. A sheet separator comprising a vacuum cylinder, a sheet-gripping sucker movable in said cylinder, compressible means normally raising said sucker when sealed by the sheet, and means actuated by suction in said cylinder of greater power than said compressible means for moving said sucker in the opposite direction and placing said compressible means under compression.

10. A sheet-separator comprising a vacuum cylinder, a vacuum tube movable in said cylinder, a sheet-gripping sucker mounted on the outer end of said tube, compressible means raising said tube and sucker when the latter is sealed by the sheet, and means actuated by suction in said cylinder for moving said tube and sucker in the opposite direction.

11. A sheet-separator comprising a vacuum cylinder, a vacuum tube movable in said cylinder, a sheet-gripping sucker mounted on the outer end of said tube, compressible means normally raising said tube and sucker when the latter is sealed by the sheet, and means actuated by suction in said cylinder of greater power than said compressible means for moving said tube and sucker in the opposite direction and placing said compressible means under compression.

CHARLES W. HARROLD.