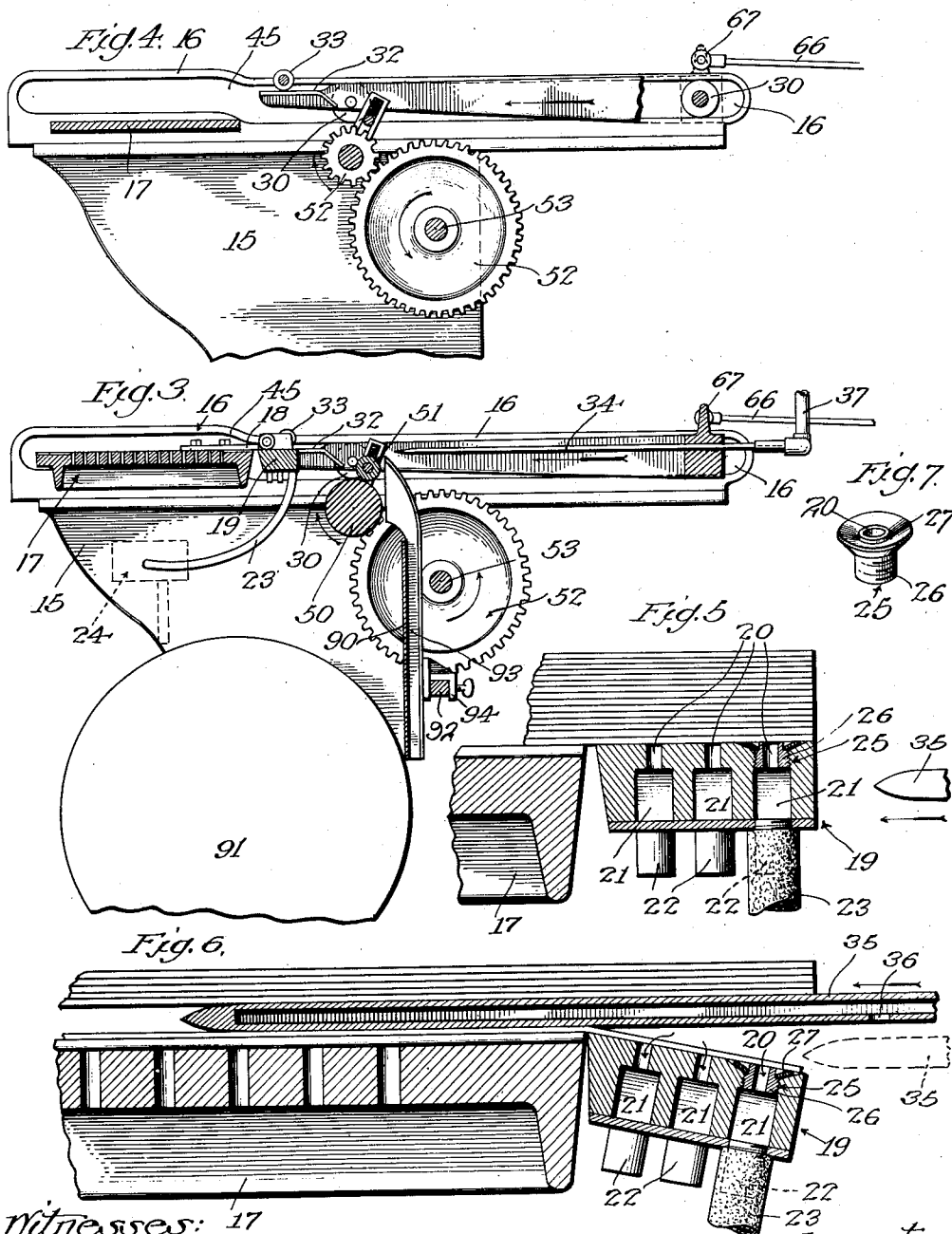


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APPLICATION FILED MAY 4, 1909.

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Patented Oct. 26, 1909.
3 SHEETS—SHEET 2.



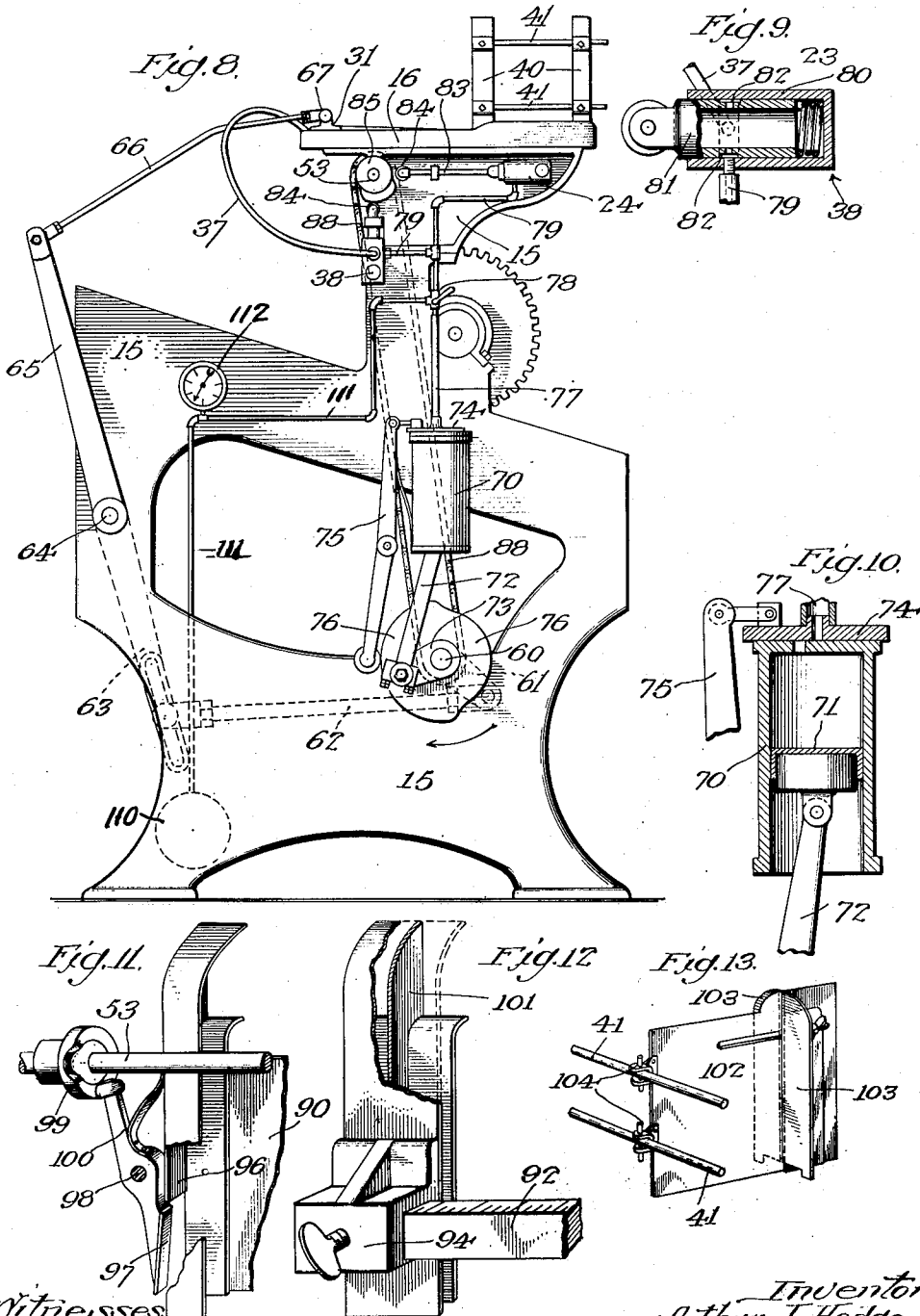
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ARTHUR J. HODGE, OF PASADENA, CALIFORNIA, ASSIGNOR TO MILLS AUTOMATIC PRESS CO., OF LOS ANGELES, CALIFORNIA, A CORPORATION OF CALIFORNIA.

SHEET-FEEDER.

937,807.

Specification of Letters Patent.

Patented Oct. 26, 1909.

Application filed May 4, 1909. Serial No. 493,854.

To all whom it may concern:

Be it known that I, ARTHUR J. HODGE, a citizen of the United States, residing at Pasadena, in the county of Los Angeles and State of California, have invented a new and useful Improvement in Sheet-Feeders, of which the following is a specification.

Heretofore considerable difficulty has been experienced in the accurate feeding of single sheets from a pile. In either removing the bottom or top sheet by mechanical or other means, it is difficult to prevent the adjacent sheet or sheets from being pulled off the pile by frictional engagement with the sheet fed off. This has been true especially of thin sheets of paper such as are used for wrapping candies and butter, etc.; and although the wrapping of the articles may be done by hand, the wrappers are almost always printed upon in a press before being used.

The present invention overcomes the difficulties mentioned for thin sheets by virtue of the novel method of removing the sheet to be fed, but it is not thereby rendered less efficient for heavier work; in fact, the mechanism is so arranged that it may be adjusted with ease for the lightest paper and the heaviest "manila" or envelopes.

Another class of work where the above difficulties are encountered is in feeding labels which have previously been embossed, the embossed portions nesting within each other when the labels are piled up. This nested condition renders it almost impossible to separate a single sheet from the pile by any longitudinal movement, it being necessary to separate the sheets transversely before moving them relatively longitudinally.

The present feeder involves a mechanism which first separates the sheets from each other, removing the pile of sheets from contact with the sheet to be fed, and then moves the sheet so separated from the remainder out of the tray. This action is effected by a set of fingers which enter the pile just above the lowermost sheet, raising the remainder of the pile, and then drawing the bottom sheet out. The edge of the lowermost sheet is separated from the remainder of the pile by means of a suction apron which bends the edge of the sheet downwardly and thus allows an opening for the entrance of the fingers. The lowermost

sheet is chosen for removal on account of the fact that its position is fixed, while that of the uppermost sheet usually varies as the pile is used up and replenished; but it is not impossible to feed the uppermost sheet with appropriate mechanism for either keeping its position constant or for guiding the feeding fingers to its varying position. In the present form of device the feeder fingers only move the sheet for a slight distance when it is passed between feeding rolls to the delivery chute or box. Either one of these feeding devices may be used for the complete travel of the sheet, either the fingers may feed the sheet completely out of the tray, or the fingers may only separate the sheets—their primary function—and the feeding rolls may carry the sheet throughout its entire movement. The main point is the separation of the sheets, the feeding of the sheets subsequently being a matter which depends more or less upon the character of the mechanism into which the sheets are fed. For instance, in the present case the sheets are fed into a printing press and it is very desirable that the alinement of the sheets be as perfect as possible. For this a combination of finger and roller feed is shown which has been found very efficient.

In the accompanying drawings:—Figure 1 is an end elevation of the improved feeder. Fig. 2 is a plan of the same. Fig. 3 is a section taken on line 3—3 of Fig. 2. Fig. 4 is a section taken on line 4—4 of Fig. 2. Figs. 5 and 6 are sections, enlarged, showing successive positions of the feeding mechanisms. Fig. 7 is a perspective detail of one of the sucker members used on the suction apron for engagement with heavy sheets. Fig. 8 is a side elevation of a typical printing press equipped with the feeder, and showing the arrangement of the different operating mechanisms with relation to each other. Fig. 9 is a detail section of the suction pressure controlling valve. Fig. 10 is a detail section of the suction pump. Fig. 11 is a detail perspective of one of the alining members equipped with a mechanical alining means. Fig. 12 is a detail perspective of the central alining member used for feeding from a double pile. Fig. 13 is a detail perspective of the member used to divide the space on the tray when two piles are used.

Referring to the drawings, 15 designates

the main frame of the feeder, which frame may be, and is in this case, the main frame of the printing press or other machine on which the feeder is placed. Mounted on the main frame on each side thereof is a cam guide 16, and between these guides a tray 17 is placed. This tray may be of any configuration and design, suiting the size of the sheets it is to feed. Its face is provided with a series of slots, holes and grooves to prevent the formation of a partial vacuum between the lowermost sheet of paper thereon and the face. Attached by means of an adjustable hinge 18 to the front edge of the tray is a vacuum or suction apron 19, the apron being pivotally movable as is indicated in Figs. 5 and 6. This apron is provided with a series of suction ports 20 arranged on a plurality of lines, there being in the present construction three sets or lines of these ports. Each set of ports is connected to an individual passage 21 in the interior of the apron and each of the passages has a tube connecting with it as at 22, the tubes affording connecting means for hose 23 leading to valve 24 which controls the vacuum supply to the apron. Ports 20 in the outer row are comprised in a small sucker member 25. This member is composed of a small ported-shank 26 having a cup shaped rubber seat 27 on its upper end for intimate contact with the paper. The outer row of ports is used for extremely heavy sheets, the sucker members clinging closely to them; and if it is necessary the whole apron may be moved out from the tray by the adjustment of hinges 18 so that a longer bend may be had on the stiffer sheets. The inner rows of ports are used for the lighter and thinner sheets.

Mounted on rollers 30 running in guides 16 is a feeder frame 31 of general U-shape. On the forward ends of this frame are two small cam surfaces 32 which engage with rollers 33 on the suction apron and normally hold the apron in its upper position, its upper surface forming an extension of the tray top. Upon the movement of the feeder frame in the direction indicated by the arrows, this cam surface passes from under the rollers on the apron and allows the apron to drop to the position shown in Fig. 6. Mounted on the feeder frame is a plurality of feeder fingers 34 and 35, fingers 34 being solid, and fingers 35 hollow with ports 36 on their under faces near their outer ends. The hollow interiors of fingers 35 are connected by tube 37 to valve 38 controlling the supply of vacuum to the fingers.

In the use of the feeder the sheets are placed on the tray between hopper corner members 40, the members being supported on frame 41 so as to be adjustable to any size of sheet. The front edges of the sheets rest

on apron 19, as is shown in Fig. 5. The feeder frame is then moved in the direction indicated by a mechanism to be hereinafter explained, and the suction apron is immediately dropped to the position shown in Fig. 6. In the meantime suction has been supplied to the ports in the apron and the lowermost sheet is carried down with it as is illustrated in Fig. 6. By this time the feeder fingers have reached such a position as is shown in dotted lines in Fig. 6, just over the lowered edge of the lowermost sheet, this being so arranged that the fingers will be sure of passing between the lowermost sheet and the remainder of the pile even in case the lower sheets of the pile should bend downwardly under their own weight. On the further forward movement of the feeder frame forward rollers 30 encounter curved portion 45 of the guides 16 and the forward ends of the frame and the fingers mounted thereon are moved upwardly in their forward movement. After this upward and forward movement the fingers continue to move horizontally forward over the lowermost sheet, raising the remainder of the pile off the same. When the fingers have reached the end of their movement suction is applied to the lowermost sheet through ports 36, the sheet being thereby held near its back edge to the outer ends of the fingers. The suction on the apron is now released and the lowermost sheet is drawn from under the pile on the back motion of the feeder fingers. The forward edge of the sheet, not being engaged by the suction of the fingers, passes off the apron and drops down between a pair of feeder rolls 50 and 51, rotating constantly in the direction indicated. The suction of the fingers is cut off as soon as the forward edge of the sheet passes between the rolls. After passing through the rolls the sheet passes into the delivery chute and through the alining mechanisms. Rolls 50 and 51 are driven by gears 52 from cam shaft 53, gears 54 connecting the two rolls.

The movements of the different parts is accomplished typically in the following manner: On frame 15 is mounted the main shaft 60 of the machine, rotating in the direction indicated. Mounted on this shaft is a small crank 61 connected by rod 62 to the lower end of an arm 63 mounted on shaft 64. Shaft 64 has two arms 65 (only one shown) mounted on it and to the upper ends of these arms are attached rods 66 pivotally connected at 67 to feeder frame 31. The whole is so arranged that the feeder frame is given the proper movement at the proper times. Mounted on the side of the frame is a pump cylinder 70 having a cup piston 71 therein. A connecting rod 72 connects piston 71 with crank 73 on the main shaft. On the top of the cylinder is a slide valve 74

worked through the medium of a lever 75 from a cam 76 mounted on the main shaft. The working of this valve is so arranged that tube 77 is connected with the interior of the cylinder on the down or suction stroke of the piston. Tube 77 connects to a valve 78 which serves to cut off the suction action from the feeding mechanism when so desired, and from this valve two pipes 79 lead to valves 24 and 38. The construction of these valves is shown in Fig. 9. They comprise a casing 80 having a spring supported plunger 81 therein. An annular port 82 extends around the plunger and connects pipe 79 with tubes 37 or 23 when the plunger is in the position shown. Plunger rods 83 are connected to the plungers and carry on their outer ends cam followers 84. Mounted on the end of shaft 53 is a cam 85 adapted to actuate the followers 84, the cam being so arranged that the valves are moved to connect and disconnect the suction to the feeder fingers and the suction apron at the times noted. Shaft 53 is driven from the main shaft 60 by a chain connection 88. A reservoir 110, connected by pipe 111, to valve 78, serves to equalize the vacuum pressure in the system, a gage 112 being provided for observation of the pressure.

Mounted across the frame of the machine is a plate 90 forming one side of the chute down which the sheets are fed, the chute leading in this case to cylinder 91 of the press. A divided bar 92 extends across the frame of the machine adjacent this plate and the chute members forming the edges and other side walls of the chute are placed on this bar. In the usual case these members are made in plain angle shape, as at 93 in Figs. 1 and 3, being secured to the bar by means of a clamp 94. The upper edges of these chute members are flared so that the sheet is brought into the correct position.

In Fig. 11, I have shown a modified form of chute member provided with a mechanical means for moving the sheets to the correct position. A portion of edge wall 96 is removed and a finger 97 swinging on pivot 98 has an end portion adapted to move into the chute member through the aperture, a cam 99 and spring 100 accomplishing the movement of the finger just as the sheet of paper passes down the chute.

In Fig. 12 is shown a chute member used to divide the chute space between members 93 when there are two piles in the tray, as when envelopes are being fed. The member is similar to the others described except that it has a wall 101 in its center so as to accommodate sheets on each side. When there are two piles in the tray a center dividing wall 102 is used. This wall has an adjustable back piece 103 against which the ends of the sheets rest, and is secured to hopper frame 41 by means of small clamps 104.

Having described my invention, what I claim is:—

1. In a sheet feeder, suction means to bend the edge of the lowermost sheet of a pile downwardly, a set of fingers adapted to enter the pile immediately above the lowermost sheet and to lift the remainder of the pile off that sheet, and suction means on the fingers to engage with the lowermost sheet.

2. In a sheet feeder, suction means to bend the edge of the lowermost sheet of a pile downwardly, a set of fingers adapted to enter the pile immediately above the lowermost sheet and to lift the remainder of the pile off that sheet, suction means on the fingers for engagement with the sheet, and mechanical means to remove the sheet from the fingers.

3. In a sheet feeder, a tray for supporting a pile of sheets, a pivoted apron supporting one edge of the pile, suction means on the apron for engagement with the lowermost sheet, means to move the apron, a set of movable fingers adapted to enter the pile immediately above the lowermost sheet and suction means on the fingers for engagement with the sheet.

4. In a sheet feeder, a tray for supporting a pile of sheets, a pivoted apron supporting one edge of the pile, suction means on the apron for engagement with the lowermost sheet of the pile, means to move the apron, a set of fingers adapted to enter the pile immediately above the lowermost sheet and to lift the remainder of the pile off of the lowermost sheet, suction means on the fingers for engagement with the sheet, and mechanical means to remove the sheet from the fingers.

5. In a sheet feeder, a tray for supporting a pile of sheets, a pivoted apron supporting one edge of the pile, suction means on the apron for engagement with the lowermost sheet of the pile, means to move the apron, a set of fingers adapted to enter the pile immediately above the lowermost sheet and to lift the remainder of the pile off of the lowermost sheet, and sheet engaging means on the fingers.

6. In a sheet feeder, a tray for supporting a pile of sheets, a pivoted apron supporting one edge of the pile, a series of suction ports in the upper face of the apron, means for supplying suction to the ports, means to allow the apron to fall to bend the edge of the lowermost sheet downwardly, a set of fingers adapted to enter the pile immediately above the lowermost sheet and to lift the remainder of the pile, suction ports on the lower faces of the fingers, means to supply suction to the ports, means to reciprocate the fingers, and a set of feeder rollers into which the lowermost sheet is fed on the outward motion of the fingers.

7. A sheet feeder, comprising a tray for supporting a pile of sheets, means to sep-

arate the edge of the lowermost sheet from the edges of the remainder, a set of reciprocating fingers adapted to enter the pile directly above the lowermost sheet and to then
5 move outwardly from the pile, and means on the fingers adapted to engage with the lowermost sheet on the outward movement of the fingers.

8. A sheet feeder, comprising a tray for
10 supporting a pile of sheets, means to separate the edge of the lowermost sheet from the edges of the remainder, a set of moving fingers adapted to enter the pile directly above the lowermost sheet and to then move
15 outwardly from the pile, means to lift the fingers and to thereby move the remainder of the pile upwardly as the fingers enter, and means on the fingers to engage with the lowermost sheet on the outward movement
20 of the fingers.

9. In a sheet feeder, a set of fingers adapt-

ed to enter a pile of sheets immediately above the lowermost one, means to move the fingers upwardly as they enter, whereby the pile is raised off the lowermost sheet, and
25 sheet engaging means on the fingers.

10. In a sheet feeder, a set of fingers adapted to enter a pile of sheets immediately above the lowermost one, cam means for raising the fingers as they enter the pile, whereby the remainder of the pile is lifted off the
30 lowermost sheet, and sheet engaging means on the fingers adapted to engage with the lowermost sheet upon the withdrawal of the fingers from the pile.
35

In witness that I claim the foregoing I have hereunto subscribed my name this 26th day of April 1909.

ARTHUR J. HODGE.

Witnesses:

JAMES T. BARKELEW,
C. R. LURZARDER.