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PRESS FEEDING DEVICE

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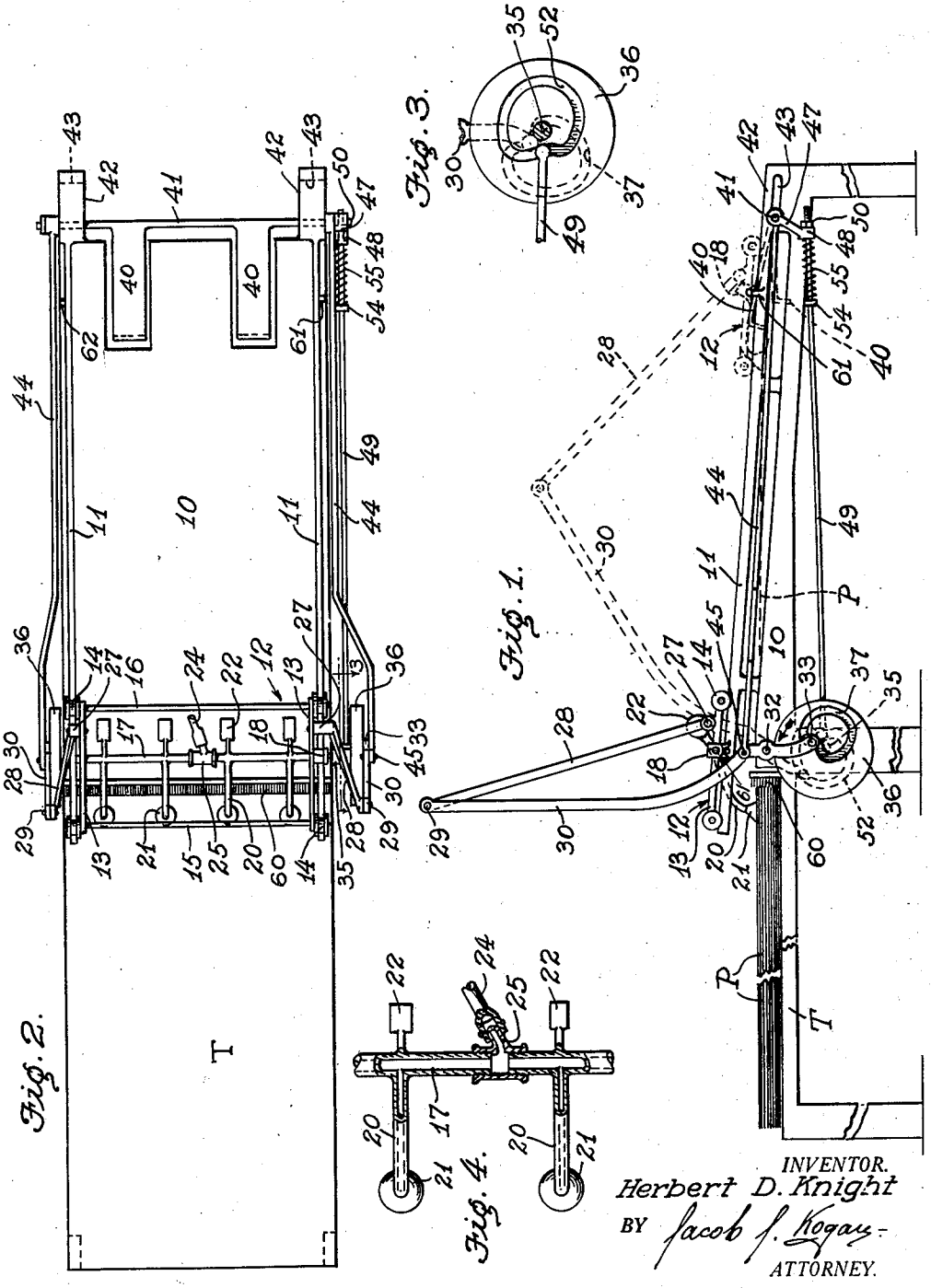


Fig. 2.

Fig. 4.

Fig. 3.

Fig. 1.

INVENTOR.
Herbert D. Knight
BY Jacob J. Kogan
ATTORNEY.

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PRESS FEEDING DEVICE

Herbert D. Knight, San Diego, Calif., assignor to Thomas J. McKee, Jr., Pasadena, Calif.

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5 Claims. (Cl. 271—26)

The present invention relates to machinery to be employed for feeding printing presses, and more particularly pertains to an aparatus for automatically taking individual sheets of paper or the like from a pile of such sheets and delivering said individual sheets into position whereby they may be transmitted into the presses for printing and/or folding purposes. More specifically stated, the invention covers an improved mechanism adapted to pick up individual sheets of paper from a stack or pile thereof, and to deliver such individual sheets, one at a time, to a table adjoining the printing machine or press, such sheets being then picked up from said table by grappling means attached to the printing machine, said grappling means delivering the sheets into the press for printing purposes.

The machinery employed until the present time for the purpose of conveying individual sheets of paper from a stack thereof to the printing press usually comprises segmental suction rollers and cooperating wiper rollers or brushes, the suction rollers being rotated and carrying the sheet of paper around therewith until said rollers have performed a half circle, at which time suction is cut off from said rollers, and the individual sheet is then carried forward to the tapes or table of the printing machine. These tapes of the printing machine are usually constructed in the form of endless belts, their actuation moving the individual sheets to the above mentioned grappling means of the printing press. The use of such machinery is found to be very cumbersome and highly defective in that these tapes frequently break, thus causing the tearing of the sheets and the necessity of stopping the machinery for repairs. Also, in view of the fact that the sheets of paper in the above described stack or pile are never found to be stacked uniformly, the use of the above described machinery, employed until the present time for automatic sheet feeding, caused such individual sheets to be frequently delivered at an angle or bias to said grappling means, which in turn caused the improper printing on such sheets in that the printing was crooked.

Therefore, the main object of the present invention is to provide an entire automatic arrangement which will feed individual sheets of paper from a stack thereof into position to be conveyed into the printing press, said arrangement avoiding the above described objections and defects. A further object of the invention is to provide a paper feeding machine which eliminates the necessity of conveying tapes. A still further object of the present invention is to provide an automatic arrangement or machine which will straighten the individual sheets before they are picked up by the grappling means conveying said sheets into the printing press or machine.

It has now been discovered that the above and other objects may be attained by providing a sheet feeding machine between the stack or pile of paper and the above described grappling means of the printing press, said sheet feeding machine being provided with means adapted to pick up individual sheets of paper from said stack thereof and to convey them individually to the grappling means without the necessity of employing any moving tapes, the machine being also provided with means adapted to straighten said individual sheets immediately prior to the time when they are picked up by said grappling means.

The invention may therefore be broadly stated to reside in a sheet feeding machine adapted to be disposed between the stack or pile of paper and the printing press or machine, said sheet feeding machine comprising means adapted to be brought in contact with the uppermost sheet of paper of said pile thereof, and adapted to adhere thereto, means in mechanical engagement with said first mentioned means and adapted to raise said first mentioned means together with the sheet of paper adhering thereto, to move said first mentioned means and said adhering sheet of paper in a substantially horizontal direction towards the printing press, and means in mechanical engagement with the first mentioned means adapted to separate and remove said sheet of paper from adherence to said first mentioned means.

The invention further resides in a sheet feeding machine disposed between a stack of paper and a printing press which comprises a table or frame, a carriage adapted to move reciprocally along the surface of said table or frame between said stack of paper and said printing press, means in mechanical engagement with said carriage adapted to be brought against the surface of the uppermost sheet of paper of said stack and to adhere thereto by means of suction created in said means, means in mechanical engagement with said first mentioned means adapted to raise said means and said sheet of paper away from the stack and onto said table, means in mechanical engagement with the first mentioned means adapted to disconnect the suction therein and to cause the desirable disengagement of said sheet of paper when the carriage moves the first mentioned means and the sheet of paper

towards the end of the table closest to the printing press, and means on said table adapted to straighten said sheet of paper, thereby permitting correct printing thereon after said sheet of paper has been moved into the printing press.

The invention further includes means which are associated with the paper straightening means and which raise said paper straightening means immediately prior to the time when the grappling means associated with the printing press pick up said individual sheets.

In its most specific form the invention resides in a sheet feeding machine disposed between the stack of paper to be fed into the printing press and said printing press, said sheet feeding machine comprising a table or frame, runways extending along the surface of said table or frame, a carriage disposed on said runways and adapted to be moved along said runways, actuating means in mechanical engagement with said carriage adapted to reciprocally move said carriage along said runways from one end of the table to the other and back, a plurality of suction cups carried by said carriage, means in cooperative engagement with said suction cups adapted to lower said cups against the surface of the uppermost sheet of paper of said pile of sheets when the carriage is at one end of its travel closest to said pile and to raise said suction cups together with the sheet of paper adhering thereto as soon as the carriage begins to move toward the printing press, means in cooperative engagement with said suction cups to create the suction therein, and means substantially at the other end of the table adapted to be brought into cooperative engagement with the suction cups to break the suction therein and thereby permit the sheet of paper thus carried by said sheet feeding machine to drop on said table substantially at or near the end thereof closest to the printing press. The invention also includes a sheet straightening arrangement located on the above mentioned table which comprises a plurality of straighteners adapted to be reciprocally moved along the surface of the table substantially at the end closest to the printing press, means in mechanical engagement with said straighteners and with the carriage actuating means adapted to create said reciprocal motion of said straighteners, and means in mechanical engagement and/or cooperation with the first mentioned means adapted to raise said straighteners from the surface of the table and away from contact with the sheet of paper thus straightened immediately prior to the time when the grappling means of the printing press picks up said sheet of paper, and to lower said straighteners back onto the table after said sheet of paper has been thus removed from the surface of said table.

One form of the structure constituting the subject-matter of the present invention is illustrated by way of example in the accompanying drawing in which:

Figure 1 is a side elevational view of the improved apparatus, said view also showing the structure on which the sheets of paper are disposed, the sheet-feeding structure being shown at the moment when the suction cups have been brought in contact with the uppermost sheet of paper of the stack thereof;

Figure 2 is a plan view of the structure shown in Figure 1;

Figure 3 is a section taken along line 3 of Figure 2; and

Figure 4 is an enlarged plan view, partly in section of the hollow shaft carrying the suction members and showing the means for communicating the suction cups or members with the vacuum-producing means.

Referring more particularly to the drawing, in which like numerals refer to like or similar elements or parts, table or frame 10 is provided with two runways 11 extending the length of table 10. A carriage, generally indicated by numeral 12, and extending across table 10 from one runway 11 to the other, is adapted to move on said runways. Said carriage 12 consists of two frames 13 equipped with wheels or rollers 14 and with cross-ties 15 and 16 connecting the two frames 13. A hollow shaft 17 extends between the frames 13 and passes therethrough, said shaft being supported by the frames but being adapted to rotate along its longitudinal axis. At one of its ends, said shaft 17 is provided with a forked member 18 rigidly attached to said shaft, the purpose of said member 18 being described hereinbelow. At spaced intervals (as seen more particularly in Figure 2), shaft 17 carries a plurality of curved or arcuated hollow levers or fingers 20. These latter are rigidly attached to shaft 17, and move therewith. The outer ends of said fingers 20 are equipped with suction cups 21. If desired, and as shown in the drawing, the opposite ends of said fingers are provided with counterweights 22. The interior of the hollow shaft communicates with an air pump (not shown) by means of a resilient tube 24, the connection being made through a sliding coupling 25 constructed so that the rotation of shaft 17 may cause such communication between the air pump and the interior of the shaft 17 to be cut off. It is obvious that, when said communication exists the suction cups 21 are thus in communication, through fingers 20, interior of shaft 17, coupling 25 and the resilient tube 24, with the air pump, by means of which the placing of the suction cups 21 on the topmost sheet of paper creates a partial vacuum in said suction cups 21. Obviously, any other means may be provided for connecting the interior of the suction cups 21 with the air pump or with any other vacuum-producing structure. Each frame 13 is hinge-connected at 27 to its respective link or arm 28. The other ends of said arms 28 are in turn hinge-connected at 29 to arcuated levers 30. These levers are attached at 32 to the sides of the table 10 by means of hinges, said hinge-connection being at an intermediate point of said levers 30. The opposite ends of these levers are provided with bosses 33, the purpose of which will be described hereinbelow.

Substantially below the points 32 at which levers 30 are hinge-connected to the sides of the table, 10, said table is provided with a horizontally disposed shaft 35 extending the width of the table and provided at its opposite ends with discs or wheels 36 rigidly attached thereto. The shaft is connected with any known means (not shown) to impart to said shaft, and therefore to said discs or wheels 36, a uniform rotary motion in the direction indicated by the arrow (see Figure 1). On their outer surfaces, the discs 36 are provided with grooved cams 37 adapted to receive the above-mentioned bosses at the ends of levers 30. The cams 37 are shaped so that the above-described rotation of the discs 36 will cause the levers 30 to move reciprocally and along segmental paths around the hinged points 32. Such motion will obviously force the carriage 12 to move reciprocally along the runways 11 from one end

of the table 10 (as shown in full lines on Figure 1) to the other end of said table (into the position shown in dotted lines), and back again. This reciprocal movement of carriage 12 from one end of the table to the other, and back, occurs once for every rotation of disc 36.

The end of table or frame 10 opposite to that carrying shaft 35 and discs 36, is provided with the above-mentioned paper straightening means. These consist of a plurality of bent plates or elbows 40 rigidly attached to a shaft 41 extending the width of table 10. On its sides, and substantially at said end, table 10 is provided with two bearings 42 provided with horizontally disposed grooves 43 extending through said bearings, said grooves being adapted to receive the ends of shaft 41. The ends of said shaft 41 are in mechanical engagement with the above mentioned levers 30 by means of levers 44, which are hinge-connected at 45 to said levers 30 at a point above 32. The exact point of connection of 44 to lever 30 is calculated so that a complete segmental movement of said lever causes shaft 41 to move in groove 43 from one end thereof to the other.

One of the ends of shaft 41 is also rigidly connected to a short lever 47, the other end of which is provided with a housing 48 through which extends a shaft 49 terminating in a bushing 50. The opposite end of said shaft 49 runs in a groove or cam 52 provided on the inner side of one of the discs 36. Shaft 49 is also equipped with a boss 54, a spring 55 being inserted between housing 48 and said boss 54.

The front end of table 10, i. e. the end which carries shaft 35 and discs 36 and which is placed substantially in juxtaposition with the table T carrying the stack or pile of paper, is provided substantially at the level of said table 10 with a brush 60, said brush extending the width of the table and having its bristles protruding horizontally outwardly. The purpose of this brush will be seen from the description of the operation of the structure. On their sides the runways 11 are provided with protruding elements 61 and 62, said elements or pins being adapted to come in contact with the forked member 18 and to move said member, thereby causing the rotation of shaft 17 carrying the suction cups 21.

The operation of the above described structure is clearly obvious to those skilled in the art. Briefly stated, the structure constituting the object of the present invention and employed for conveying systematically individual sheets of paper from a stack thereof to the grappling means of a printing press, is disposed between the table T carrying the stack of paper P and the printing press not shown in the drawing. Assuming that at its initial moment the structure is in the position shown in solid lines in Figures 1 and 2, the rotation of shaft 35, and therefore of the discs 36, as shown in Figure 1, momentarily cause carriage 12 to be moved, due to the action of cam 37 and levers 30 and 28, in the direction of the location of table T (to the left as seen in Figure 1). During such movement the forked member 18 straddles pin 61 and a further motion to the left causes an angular movement of the member 18 and therefore a rotation of shaft 17 rigidly attached thereto. This causes the lowering of the suction cups 21 onto the surface of the uppermost sheet of paper of stack P. The suction created in the heads of the cups 21 by means of the pump communicating with the interior of said heads through levers 20, shaft 17, slide coupling 25 and hose or tube 24, causes the suction cups to be rigidly attached to said uppermost sheet of paper. Further rotation of shaft 35 and of the discs 36 will then cause movement of lever 30 in cam 37 which movement will cause the carriage 12 to move on the runways 11 away from the table T and towards the other end of table 10. As soon as this movement of carriage 12 to the right is initiated, there is a disengagement of forked member 18 from pin 61, the counterweights 22 on fingers 20 causing the raising of the cups 21 and therefore of the sheet of paper held by said suction cups. This raising elevates the sheet of paper above the surface of the table 10. The brush 60 provided at the end of the table closest to the stack of paper P acts to separate any of the sheets of paper which may have accidentally been picked up with the uppermost sheet. It is clearly obvious that further rotation of the discs 36 in the direction shown by the arrow in Figure 1 will cause lever 30 hinged at 32 to move in cam 37, the other end of said lever through the co-operating arm 28 moving carriage 12, and therefore the sheet of paper held by the suction in the suction cups 21, to the end of table 10 closest to the printing press. When carriage 12 reaches the end of its movement in said direction, pin 62 comes in contact with forked member 18 to cause a rotation of shaft 17 so that the communication between the interior of said shaft 17 and hose 24 in sliding coupling 25 is cut off. This breaks the vacuum in suction cups 21, thereby permitting the sheet of paper thus delivered to the end of table 10 closest to the printing press to be dropped onto the surface of said table 10. Further rotation of shaft 35 will cause carriage 12, through the medium of discs 36, cams 37, levers 30 and arms 28 to move again towards the end of table 10 closest to the stack of paper P, at which time the cycle of operation above described is again initiated.

While carriage 13, by means of the suction cups 21, is delivering a sheet of paper to the surface of table 10, lever 44 attached to lever 30 at 45 is causing a movement of shaft 41 in grooves or slots 43 in a direction away from the table and towards the location of the printing press. This movement naturally also causes a horizontal movement, in the same direction, of plates or elbows 40. After carriage 13 has dropped its sheet of paper onto said surface of the table, as aforesaid, and while said carriage is being conducted along the runways 11 toward the table T to pick up the next sheet of paper, lever 44 causes the movement of shaft 41 in a direction opposite to that described above, i. e. towards the left as shown in Figures 1 and 2. This causes the elbows 40 to move against the edge of the sheet of paper lying on said table 10, thereby straightening and/or aligning the same.

It is to be pointed out that the edge of table 10 closest to the printing press is not constructed on a straight line (see Figure 2). The purpose of the indentures is to permit the elbows 40 to straighten the individual sheets of paper dropped onto the surface of table 10 by the suction cups 21, and to allow the well-known grappling means of the printing press to pick up the thus aligned sheet and to carry the same into the press.

To permit the above-mentioned grappling means to move the sheet of paper laterally along the table, it is obviously necessary to elevate the elbows or bends 40. For this purpose, I have provided lever 49 actuated by cam 52 on the

inner side of disc 36. This lever 49, through the action of lever 47, rotates shaft 41 and thus raises the elbows 40 out of the way just prior to the moment when the paper is to be picked up by the grappling means. The lost motion device, consisting of housing 48 on lever 47 and of the boss 54 and spring 55 on lever 49, causes the rotation of shaft 41 only when lever 49 has been moved the length of its stroke to the left (as shown in the drawing). At this moment, bushing 50 on lever 49 comes in abutment with housing 48, so that any further movement of lever 49 causes the rotation of shaft 41, and therefore the raising of the elbows 40. Although not a part of the present invention, lever 49 may be provided with means permitting a "snap action" substantially at the moment when it is necessary to lift the elbows 40. Such "snap acting" structures are well known to those skilled in the art, and it is not deemed necessary to describe them in detail.

From the above disclosure it is clear that the new structure is adapted to pick up an individual sheet from a stack thereof, separate any sheets which may have accidentally adhered to the thus picked sheet, deliver said sheet to the place from which it is to be carried into the printing press by the grappling means thereof, and to straighten or align the thus delivered sheet prior to the moment when it is to be thus taken up by said grappling means.

Although I have illustrated and described a single form of the invention and described it as applied to the feeding of sheets in a position to be delivered into the printing press, I am aware of the fact that modifications can be made in the construction and combinations of parts, and that it can be used for feeding purposes of a different nature without departing from the scope of the invention as expressed in the claims. Thus, instead of having pin 62 merely cut off the suction in cups 21, said pin may be adapted to rotate shaft 17 to such a position that, through a separate opening in coupling 25, the interior of cups 21 will be brought in communication with the atmosphere, thus causing the sheets of paper carried by said cups to be dropped onto the surface of table 10 with greater surety.

Many other modifications and arrangements are to be considered to be within the scope of the present invention, which is to be limited only by the appended claims.

I claim:

1. In combination, a frame, paper delivering means adapted to deliver onto said frame, at predetermined intervals of time, individual sheets of paper from a stack thereof, and paper straightening means on said table adapted to straighten and align the thus delivered individual sheets, said means comprising a plurality of arms, a shaft carrying said arms and extending across said frame, guides on said frame adapted to support and guide said shaft, and means in cooperative engagement with said shaft and adapted to move said shaft, thereby bringing the arms attached to said shaft against an edge of the sheet of paper to align said latter.

2. In a structure according to claim 1, wherein the last-mentioned means are in cooperative engagement with the paper-delivering means, and are actuated by said paper-delivering means to move the paper-aligning arms in contact with the edge of the individual sheet of paper substantially after said sheet has been delivered onto the frame by the paper-delivering means.

3. In a structure according to claim 1, wherein the shaft is also provided with means adapted to rotate intermittently said shaft and to thereby raise and lower the arms attached to said shaft substantially after said arms have aligned each sheet of paper delivered onto the frame by the paper-delivering means.

4. A mechanism for feeding aligned sheets of paper or the like from a pile thereof to the grappling means of a printing press, which comprises a frame, a carriage adapted to move reciprocally on said frame, actuating means adapted to effect said reciprocal movement of said carriage, suction members carried by said carriage, means in cooperative engagement with said suction members and adapted to effect a dipping of said members, means in mechanical engagement with said suction members adapted intermittently to create and then break a vacuum in said suction members, and paper straightening means on said frame adapted to straighten and align the delivered individual sheets, said means comprising a plurality of arms, a shaft carrying said arms and extending across said frame, guides on said frame adapted to support and guide said shaft, and means in cooperative engagement with said shaft and adapted to move said shaft, thereby bringing the arms attached to said shaft against an edge of the sheet of paper to align said latter.

5. In a structure according to claim 4 wherein the last-mentioned means are in cooperative engagement with the carriage actuating means, and are actuated by said carriage-actuating means to move the paper-aligning arms in contact with the edge of the individual sheet of paper substantially after said sheet has been delivered onto the frame by the suction members.

HERBERT D. KNIGHT.