June 9, 1931. N. G. A. STRÖMBERG ET AL 1,809,495

SHEET FEEDING MECHANISM

Filed Sept. 4, 1929 2 Sheets-Sheet 1

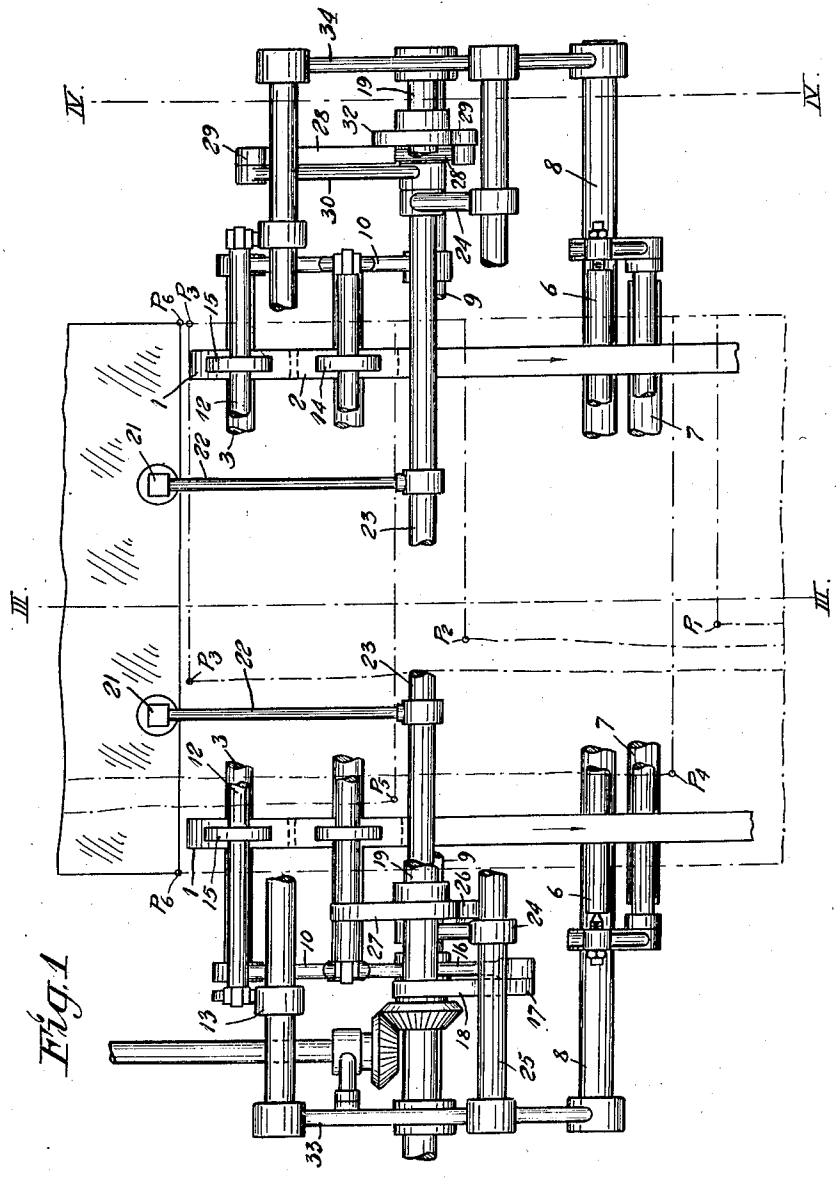


Fig. 1

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Fig. 2

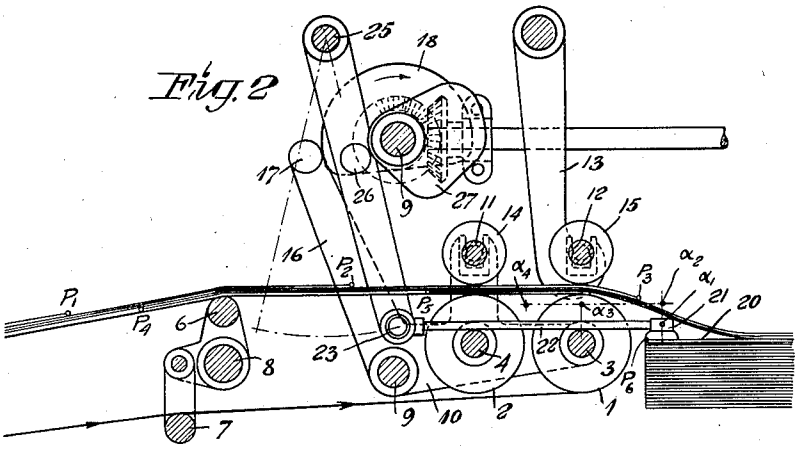


Fig. 3

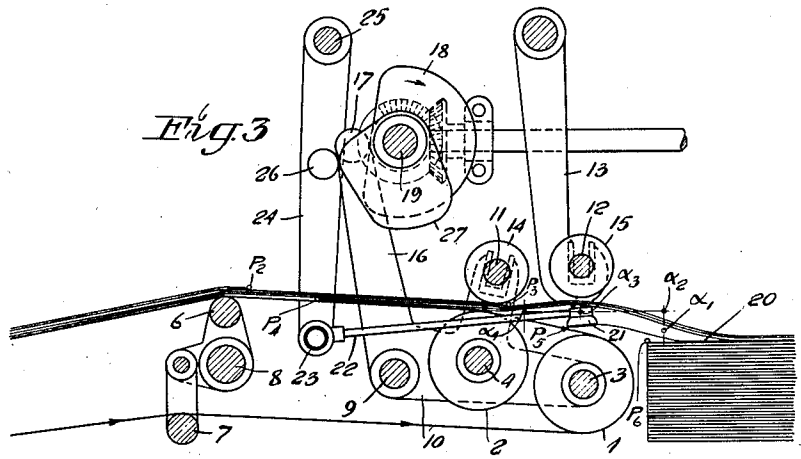
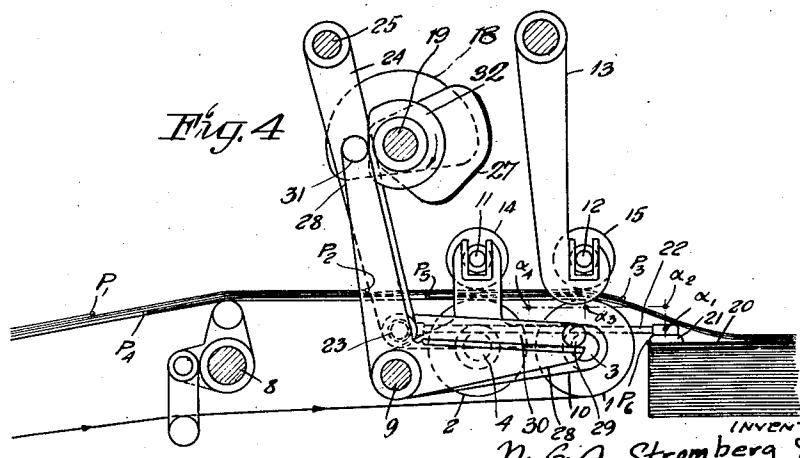


Fig. 4



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UNITED STATES PATENT OFFICE

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SHEET FEEDING MECHANISM

Application filed September 4, 1929, Serial No. 390,408, and in Sweden November 17, 1928.

The present invention refers to a method and an arrangement for feeding sheets in sheet feeding apparatus for printing presses, folding machines and so forth. The machines as hitherto constructed for this purpose suffer from many short-comings and disadvantages. In many cases the sheets are conveyed one at a time from the feeder to the printing press or the like on band conveyers, and by reason of the fact that each sheet is to be adjusted, prior to entering the printing press, with respect to its position, partly against front abutments, and partly against means for a lateral adjustment, the speed of each sheet must be reduced in the proximity of the front abutments. Therefore, an irregular speed is imparted to the band conveyer and thus also to the sheets, which speed is reduced when the sheet approaches the printing press. For this reason it is frequently difficult, to prevent the sheets, which are fed at a great initial speed, from sliding at the reduction in speed, adjacent to the printing press, and to avoid that the sheets will thus not be gripped by the gripping device of the printing cylinder so as to move past the same. A further disadvantage is that the sliding sheet may under certain circumstances, by reason of its great speed, bounce against the abutments. In every instance the result will be a misprint. Experience also shows that, owing to the shortcomings and drawbacks stated, most interruptions in printing at a great speed occur in conveying the sheet from the sheet pile.

The present invention has for its object to obviate the said disadvantages, which is effected by the sheets being fed from the sheet pile onto the abutments of the printing machine, folding machine or the like, on a band conveyer moving very slowly, the sheets being so arranged on said conveyer as to partly overlap one another, similarly as the scales of a fish. The feeding may be effected partly so that a sheet is fed underneath the next preceding one, and partly so that a sheet is fed above the next preceding one. In the first mentioned case, before a sheet has left the sheet pile, the feeding of the next sheet underneath the same should preferably commence. In the second case, after a sheet has left the pile, the next sheet should preferably be partly fed over the same. The band conveyer may be in continuous movement while the sheets are successively gripped and delivered to the printing press. Thus the speed of the printing press may be great, without incurring the risk of getting the sheets disarranged in any way so as to cause interruptions and the like in operation, in addition to which an accurate registration is obtained.

The arrangement according to the invention consists substantially of members (suction nozzles or the like) operating underneath or above the sheet conveyer and adapted to grip and/or convey the sheets. These members are guided and devised in such a manner as to pass either underneath or above a sheet on having delivered the same, back to their initial position. The members operate between endless bands forming the band conveyer, said bands being arranged in the same plane at certain intervals and being guided over rolls. The proper relative working movement between the gripping members and the band conveyer is brought about by means of certain mechanically controlled members which are to be fully explained in the following.

The invention will be fully described hereinafter with reference to the embodiment illustrated in the accompanying drawings. Fig. 1 is an assembly drawing of the machine in plan view. Fig. 2 shows a vertical longitudinal section of the arrangement on line III—III in Fig. 1. Fig. 3 corresponds to Fig. 2, while showing the parts in another position. Fig. 4 shows a longitudinal section on line IV—IV in Fig. 1.

The machine comprises two side frames 33 and 34 separated by a plurality of connecting rods to be described in the following, said connecting rods also serving as pivots for a number of rotatable parts of the machine. The main shaft 19 is suitably connected to the press, the folding machine or the like, and is driven together with the latter, the main shaft making one revolution per print. The main shaft 19 is provided with three cam disks 18, 27 and 32 operating

against the slide rolls 17, 26 and 31 respectively. Of the latter, the slide roll 17 is provided on an angular member 10, 16, which is called the band bridge in the following, and which is rotatable about the transversal shaft 9. This so-called band-bridge carries on its one arm 10 the three shafts 3, 4 and 11 extending transversely over the machine and carried at their opposite ends by a similar band bridge. Secured on shaft 3 are two or more band rolls 1, and on shaft 4 there are two or more similar band rolls 2. Extending over each pair of rolls 1 and 2 is an endless conveyor band 5 adapted to feed the sheets to the proximity of the printing cylinder. The band 5 is driven by means of sprocket chains or a toothed gearing from shaft 19, the sprocket chain or the gear wheels being preferably arranged to drive both rolls 1 and 2. The conveyer band 5 is further guided by the band roll 6 and the band tensioning roll 7, which latter are both arranged on the common transversal shaft 8. Right above each roll 1 and 2 is arranged a rubber wheel 15 and 14 respectively, said wheels being provided on the transversal shafts 12 and 11 respectively. Of these the shaft 12 is carried by two bearings 13 secured on a bearing brace extending transversely between the frames, while shaft 11 is supported by bearings provided in the projecting parts of the band bridges 10 (see Fig. 3).

The cam disk 27 secured on the main shaft 19 operates against the slide roll 26 which is provided on the one of the two arms 24 secured to the transversal rod 25, which is pivotally mounted in the two side frames. The arms 24 carry between them at their lower ends the transversal pipe 23, from which extend a number of smaller pipes 22 provided with nozzles 21. The said nozzles serve to lift the said sheets by suction from a sheet pile, and to retain said sheets during a certain period, for which purpose vacuum may be produced in the pipe system 21, 22, 23, for instance by means of an air pump. The effect of the movement of the cam disk 27 consists in that it actuates the slide roll 26 provided on the one arm, so that the arms 24 are caused to swing. The pipe system 21, 22, 23 secured to the lower portion of said arms will then perform a reciprocating movement between the points α_2 and α_4. Pipe 23 is rotatably mounted in the lower ends of the arms 24, and in order to guide the same together with the smaller pipes 24 and their nozzles 21 in the vertical direction, there is secured an arm 30 to the pipe (Fig. 4), which arm is provided with a slide roll 29 rolling on a bell crank lever 28. This bell crank lever is mounted about the same shaft 9 as the band bridge 10, 16.

The cam disk 32 attached to the main shaft 19 has for its object to impart a movement to the bell crank lever 28 so that the nozzles 21 are raised and lowered, through the actuation of said arm, in relation to the always constant level of the sheets 20. This is effected by the cam disk acting during its rotation against the slide roll 31 provided on the bell crank lever 28, whereby the said bell crank lever obtains a tilting movement which is transferred onto the slide roll 29 pivotally connected with the arm 30. The arm 30 is, in turn, secured to the pipe 23, so that the effect of the movement of the cam disk 32 will be that the roll 29 is moved up and down by the bell crank lever 28, and that the nozzles 21 move from the level α_1 to the level α_2, that is to say up and down relatively to the sheet pile.

The latter is provided on a lift table known per se, said table rising according to the progress of work, so that the uppermost sheet will always occupy a position at a constant level.

All of the above-mentioned arms and the like are spring-actuated so that the slide rolls never loose their contact with the cam disks.

The operation of the machine will be described in the following. As a starting point that moment may be selected, when the nozzles 21 bear against the uppermost sheet of the pile 20 (Fig. 2). The main shaft is assumed to rotate in the direction indicated by the arrow in the drawings.

Movement 1.—The sheet is sucked fast against the nozzles 21 by means of a vacuum produced within the pipe system 21, 22, 23 in the manner previously described. The said system communicates through a tubing with a valve system not shown, which is controlled by a cam disk (not shown) on the cam shaft 19, whereby the air passage is closed and opened at the proper moment.

Movement 2.—The suction nozzles 21 are raised together with the uppermost sheet. This is effected by the bell crank lever 28 with the roll guide being turned upwardly by the cam disk 32 operating against the slide roll 31 (Fig. 4).

Movement 3.—The band rolls 1 and 3 are lowered by the band bridge 10, 16 being lowered under the control of the cam disk 18 which actuates the slide roll 17 provided on the lever arm 16 of the bridge. The wheels 14 on shaft 11 are thus entrained while retaining the sheets already fed in between the rolls 2 and 14, (Fig. 3).

Movement 4.—The suction nozzles 21 are now moving forwards together with the sheet from α_2 to α_3. This movement is produced by the transversal pipe 23 being moved forwards by the two arms 24. As previously stated, these arms are actuated by the cam disk 27, which operates against the slide roll 26 provided on the one of the arms 24.

Movement 5.—In the position of the suction nozzles at α_3 (Fig. 3) the vacuum ceases

by the air valve being opened, and the sheet falls down on the band rolls 1.

Movement 6.—The pipe system 21, 22, 23 continues to move to its extreme front position (the nozzles 21 move from α_3 to α_4). At the same time the band bridge 10, 16 is raised together with the band rolls 1 and 2, as well as with the sheet. When the band rolls 1 are pressed up against the rolls 15, the sheet which was last clamped between them is now brought into movement toward the press together with the other moving sheets.

Movement 7.—The nozzles 21 are moved backwards from α_4 to α_2, which is facilitated by the fact that the band bridge is raised (Fig. 2), and the nozzles will then pass underneath the sheets previously fed forth.

Movement 8.—The nozzles 21 are lowered toward the sheet pile 20, that is to say from α_2 to α_1. The movement is produced by the bell crank lever 28 being lowered through the action of the cam disk 32 on the slide roll 31, the pipe system 21, 22, 23 being then entrained, until the nozzle 21 has been positioned on the sheet pile. Then movement 1 commences anew, and so forth.

The operations are repeated according to movements 1 to 8. The sheets P_1, P_2, P_3 and so forth thus fed forth (see Figs. 1–4) will lay themselves partly beneath each other at certain intervals, and are moved forwards by the underlying conveyer bands under a slow continuous movement onto the abutments at the printing cylinder of the press, where they are gripped by the gripping device of the cylinder. The machine may obviously also be arranged so that the sheets will be placed partly above each other at certain intervals.

The machine is specially adapted for the feeding of all types of paper, from the thinnest tissue paper to the thickest card board, but may evidently also be used for other materials, such as fabric, etc.

What we claim is:—

1. An arrangement for feeding sheets in sheet feeding apparatus for printing machines and the like, including endless sheet conveying bands, means movably supporting the bands in spaced relation whereby portions thereof may be utilized as supporting and conveying means for sheets, and gripping and conveying members movable above and below the plane of the supporting and conveying portions of the bands, and power operated actuating means for moving the gripping and conveying members to displace the latter relative to the plane of the conveying means of the bands.

2. An arrangement for feeding sheets in sheet feeding apparatus for printing and like machines, including sheet conveying bands, rotatable members supporting said bands for movement, power operated means for shifting the supporting members associated with certain of the rotatable members, and sheet gripping and conveying members for arranging sheets in continuous overlapping relation on said bands.

3. An arrangement for feeding sheets in sheet feeding apparatus for printing and like machines, including sheet conveying means, sheet gripping and conveying means for arranging sheets in continuous overlapping relation, said gripping and conveying means including an oscillating supporting arm, a pipe carried by said arm, additional pipes communicating with the first mentioned pipe, nozzles communicating with the second mentioned pipes and adapted to engage and grip a sheet by the suction effect produced by pressure reduction in said pipes, and means for effecting axial and lateral movement of the second mentioned pipes with said nozzles.

4. An arrangement for feeding sheets in sheet feeding apparatus for printing and like machines, including conveying means including a vertically movable conveying element, sheet gripping and conveying members movable relative to the conveying element for arranging sheets in continuous overlapping relation thereon, and means for moving the conveying element vertically during the movement of the gripping and conveying members, whereby as the latter move to a position to deposit a sheet on the conveying element the latter is lowered.

5. An arrangement for feeding sheets in sheet feeding apparatus for printing and like machines, characterized by the provision of a conveyor mounted for movement bodily at one end, gripping and conveying members for arranging sheets in continuous overlapping relation on said conveyor, actuating members for effecting movement of said end of the conveyor and said gripping and conveying members, and common pivoting means for both of the actuating members.

6. An arrangement for feeding sheets from a stack including means for feeding sheets in partly overlapping relation continuously from the sheet stack, said means including at least two suction members arranged and operating below the overlapping sheets, said suction members being adapted to grip the uppermost sheet of the stack at points along the front edge of the sheet and remove the latter from the stack in a direction perpendicular to the front edge of the sheet and to return to their initial position after delivery of the sheet.

7. An arrangement for feeding sheets from a stack including means for feeding sheets in partly overlapping relation continuously from the sheet stack, said means including at least two suction members arranged and operating below the overlapping sheets, said suction members being adapted to grip the uppermost sheet of the stack at points along

the front edge of the sheet and remove the latter from the stack in a direction perpendicular to the front edge of the sheet and to return to their initial position after delivery of the sheet, and means controlling the movement of said suction members.

8. An arrangement for feeding sheets from a stack including means for feeding sheets in partly overlapping relation continuously from a sheet stack, said means including at least two suction members arranged and operating below the overlapping sheets, pivoted arms, a pipe connecting said arms and communicating with the suction members, means for actuating said arms to move the suction members laterally with respect to the stack of sheets, and means to elevate the suction members with respect to said stack.

9. An arrangement for feeding sheets from a stack including means for feeding sheets in partly overlapping relation continuously from the sheet stack, said means including at least two suction members arranged and operating below the overlapping sheets, said suction members being adapted to grip the uppermost sheet of the stack at points along the front edge of the sheet and remove the latter from the stack in a direction perpendicular to the front edge of the sheet and to return to their initial position after delivery of the sheet, a conveyor arranged adjacent the stack of sheets, means movably supporting one end of the conveyor, and means for lowering the portion of the conveyor contiguous to the stack substantially coincidentally with the withdrawing movement of the suction members.

10. An arrangement for feeding sheets from a stack including means for feeding sheets in partly overlapping relation continuously from the sheet stack, said means including at least two suction members arranged and operating below the overlapping sheets, said suction members being adapted to grip the uppermost sheet of the stack at points along the front edge of the sheet and remove the latter from the stack in a direction perpendicular to the front edge of the sheet and to return to their initial position after delivery of the sheet, a conveyor for the sheets, rollers associated with the conveyor and arranged at different distances from the stack of sheets, and means for effecting relative movement of one roller and the adjacent portion of the conveyor in timed relation to the movement of the suction members.

11. An arrangement for feeding sheets from a stack including means for feeding sheets in partly overlapping relation continuously from the sheet stack, said means including at least two suction members arranged and operating below the overlapping sheets, said suction members being adapted to grip the uppermost sheet of the stack at points along the front edge of the sheet and remove the latter from the stack in a direction perpendicular to the front edge of the sheet and to return to their initial position after delivery of the sheet, a conveyor for the sheets, rollers associated with the conveyor and arranged at different distances from the stack of sheets, and means for effecting relative movement of one roller and the adjacent portion of the conveyor in timed relation to the movement of the suction members, the other roller continually exerting pressure on the conveyor.

12. An arrangement for feeding sheets from a stack including means for feeding sheets in partly overlapping relation continuously from the sheet stack, said means including at least two suction members arranged and operating below the overlapping sheets, said suction members being adapted to grip the uppermost sheet of the stack at points along the front edge of the sheet and remove the latter from the stack in a direction perpendicular to the front edge of the sheet and to return to their initial position after delivery of the sheet, a conveyor for the sheets, rollers associated with the conveyor and arranged at different distances from the stack of shee s, and means for effecting relative movement of one roller and the adjacent portion of the conveyor in timed relation to the movement of the suction members, the other roller continually exerting pressure on the conveyor, the first and second mentioned rollers being independently mounted.

13. An arrangement for feeding sheets from a stack including means for feeding sheets in partly overlapping relation continuously from the sheet stack, said means including at least two suction members arranged and operating below the overlapping sheets, said suction members being adapted to grip the uppermost sheet of the stack at points along the front edge of the sheet and remove the latter from the stack in a direction perpendicular to the front edge of the sheet and to return to their initial position after delivery of the sheet, a conveyor associated with the suction members, and a pivotal mounting common to both the suction members and a portion of said conveyor.

In testimony whereof we affix our signatures.

NILS GUSTAF ALLANSON STRÖMBERG.
GEORG WILHELM WIDLUND.