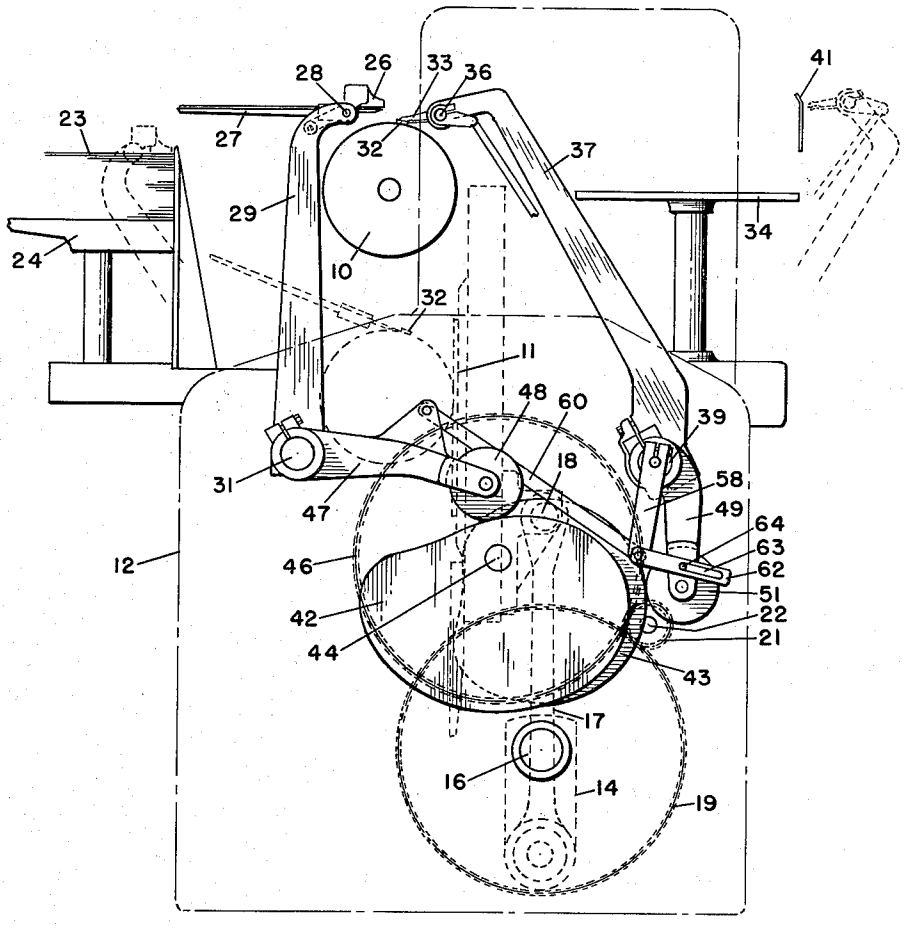
Aug. 8, 1961 H. E. PEYREBRUNE ET AL 2,995,358

SHEET HANDLING MECHANISM

Filed Jan. 12, 1959 2 Sheets-Sheet 1

Fig. 1



INVENTORS
HENRI E PEYREBRUNE
BRUNO B PASQUINELLI

BY

Byron Hume Groves & Clement

ATTORNEYS

Aug. 8, 1961 H. E. PEYREBRUNE ET AL 2,995,358

SHEET HANDLING MECHANISM

Filed Jan. 12, 1959 2 Sheets-Sheet 2

Fig. 2

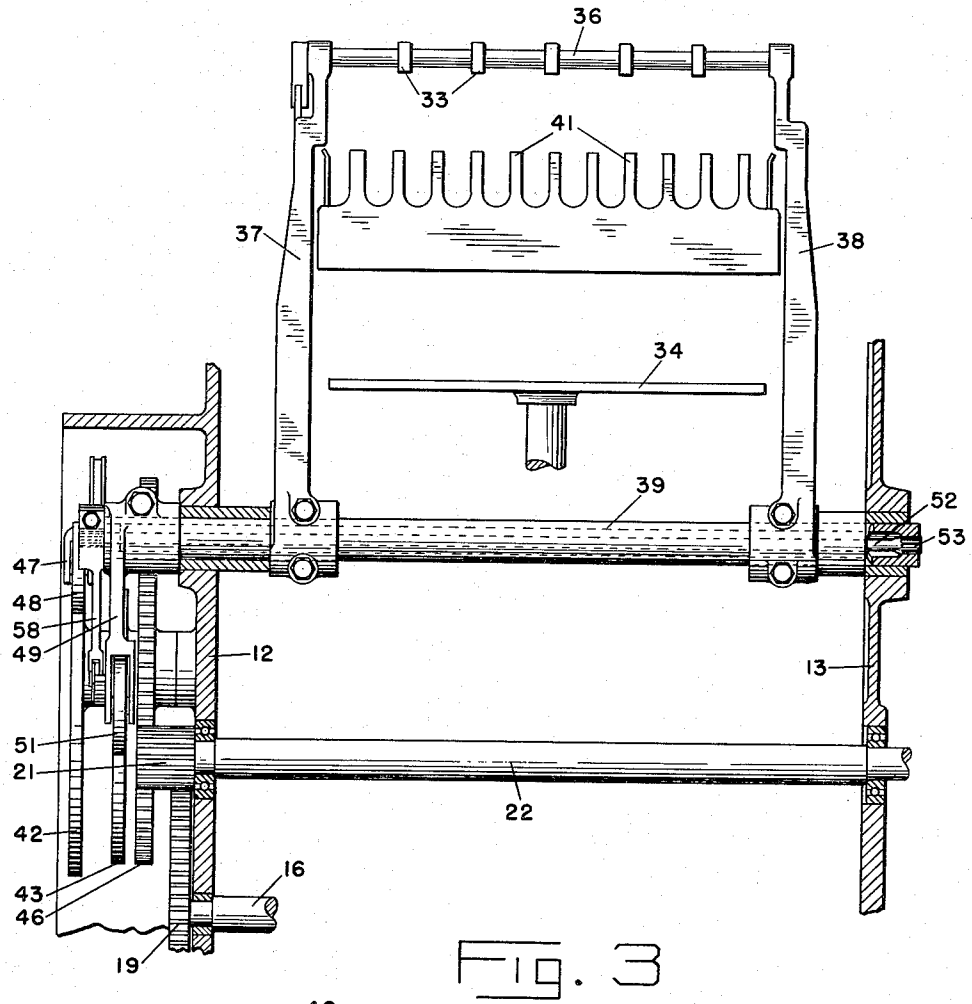
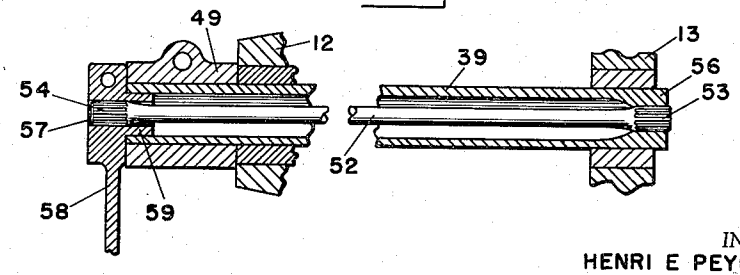


Fig. 3



INVENTORS
HENRI E PEYREBRUNE
BRUNO B PASQUINELLI

BY

Byron Hume Green & Clement

ATTORNEYS

United States Patent Office

2,995,358

Patented Aug. 8, 1961

2,995,358

SHEET HANDLING MECHANISM

Henri E. Peyrebrune, River Forest, and Bruno B. Pasquinelli, Evergreen Park, Ill., assignors to Michle-Goss-Dexter, Incorporated, Chicago, Ill., a corporation of Delaware

Filed Jan. 12, 1959, Ser. No. 786,149

8 Claims. (Cl. 271—3)

This invention pertains to sheet feeding and delivery mechanisms for printing presses and is particularly adapted for use on printing presses of the vertical class wherein the sheets to be printed are transferred to and conveyed from the impression cylinder by means of oscillating members. More specifically it is directed to an improved unitary drive mechanism for actuating the feeder and delivery mechanisms in unison and in precise timed relation with the reciprocating motion of the impression cylinder during the complete cycle of operation.

In the past, it has been the established practice to use box or ridge cam mechanisms for driving the feeder and delivery arms of vertical presses in a manner such as is disclosed in the prior United States Patents 1,567,362 and 2,276,269. Such mechanisms have proved to be efficient and satisfactory under normal operating conditions, but they are relatively expensive to manufacture and, moreover, due to the play or lost motion inherent in such box cam mechanisms, the feeder and delivery arms are subject to excessive vibrations as the speed of the press is increased. These vibrations are caused by the cam follower transferring from one cam surface to the other during the cycle of operation and the effects are most pronounced at the points of reversal. It is precisely at these points in the cycle of operation that the feeder suckers deposit a sheet in register on the register table and/or the delivery grippers are in the process of taking a sheet from the impression cylinder and, therefore, it will be apparent that excessive vibrations at these critical moments in the cycle will greatly magnify the problem of maintaining accurate register and control of the sheet. It is also known to use open type cams for actuating the feeder and delivery arms in which case separate compression spring assemblies are utilized to maintain the respective cam followers in contact with the cam surfaces and to effect the return movement of the respective cam levers. Due to the rather extensive travel of the cam levers, however, relatively large compression spring assemblies are required which obviously take up considerable space in a relatively confined area and their location and arrangement must be such as to render other elements of the drive mechanism relatively inaccessible.

In accordance with the present invention, advantage is taken of the economy afforded by open type cams for actuating the feeder and delivery mechanism. A pair of such cams are coaxially mounted for rotation about the axis of a common shaft located between the feeder and delivery arm supporting shafts and a single resilient member is utilized to preload and maintain the feeder and delivery cam levers against their respective cams. Moreover, the actuating cams are so constructed and arranged that they actuate the respective cam levers substantially in unison and in the same general direction to thereby minimize the extent of relative motion between said levers so that a relatively high tension, preloaded spring member can be used for optimum efficiency and without danger of imposing excessive stresses thereon which might exceed its modulus of elasticity. Thus the spring member can be preloaded to exert a predetermined tension on the cam levers sufficient to overcome the maximum acceleration forces of the feeder and delivery mechanisms and because of the substantially conjugate motions of said levers, the initial tension on said spring member remains substantially constant throughout the complete cycle of operation.

It is a primary object of this invention, therefore, to provide an improved drive means for the feeder and delivery mechanism of a vertical press wherein lost motion between the respective control members and vibration resulting therefrom are completely eliminated.

Another object is to provide a mechanism wherein a single, resilient member is employed whereby to preload and maintain the feeder and delivery cam levers against their respective cam surfaces.

A further object is to provide a drive mechanism wherein the force exerted against the respective cams is maintained substantially constant and at a predetermined minimum during the complete cycle of operation.

A still further object is to provide cam actuated drive mechanism wherein the respective cam levers have a minimum of relative motion therebetween, thereby permitting the use of a single high tension spring member for preloading and maintaining the levers against their respective cams.

A further object is to provide a drive mechanism wherein the resilient member is fully enclosed within the delivery shaft in a compact manner whereby to save space and provide for efficient operation.

With these and other objects in view, the invention may consist of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings, and claims appended thereto.

In the drawings which illustrate an embodiment of the invention and wherein like reference numerals are used to designate like parts;

FIGURE 1 is a side elevational view illustrating the feeder and delivery drive mechanism as embodied in a vertical printing press;

FIGURE 2 is an enlarged sectional view taken substantially along line II—II of FIGURE 1; and

FIGURE 3 is an enlarged sectional view showing the manner in which the torsion bar is mounted within the delivery shaft.

The feeder and delivery arm drive mechanism is illustrated in FIGURE 1 as embodied in a vertical type of printing press wherein the impression cylinder **10** and the coacting type bed **11** are adapted to be reciprocated vertically in opposite directions. The bed and cylinder are suitably supported between the side frame members **12** and **13** and are reciprocated by means of a crank **14** which is secured to one end of the crank shaft **16**. Motion is transmitted from the crank **14** to the bed **11** through a connecting rod **17** which is connected between the crank and a pin or trunnion **18** secured to the rear side of the bed. The shaft **16** is suitably journalled for rotation in the frame member **12** and is driven by a gear **19** which is adapted to mesh with the main drive pinion **21** fixed on the end of the main drive shaft **22**. Shaft **22** in turn is journalled in the side frame members **12** and **13** and is driven from the main source of power, not shown.

The mechanism whereby the driving force is transmitted from the bed to the impression cylinder assembly has not been shown because it forms no part of the present invention. It will be understood, however, that as the bed reciprocates in its vertical path, the cylinder reciprocates relative thereto in opposite directions. Moreover, on its downward or idle stroke, the cylinder is locked against rotation whereas, on its upward or printing stroke, suitable drive means are engaged to rotate the cylinder in the same direction as the printing form

on the oppositely moving bed to print an impression on a sheet of paper carried by the cylinder all as is well known in the art.

The sheets 23 to be printed are supported on a feed table 24 at one side of the impression cylinder and are arranged to be advanced toward said cylinder by means of pneumatic separators 26 which engage and separate each individual sheet from its position on the top of the pile and transfer it to a position in register on the transfer table 27. A series of these separators are arranged in spaced relation on a transverse shaft 28 which is supported in the free ends of a pair of feeder arms 29, which are secured in spaced relation to a supporting shaft 31 mounted for rotaiton in the side frame members 12 and 13.

The timing of the feeder arms is such that the separators 26 deposit a sheet on the transfer table 27 each time the latter is in a horizontal position, as shown in solid lines in FIGURE 1 and when the impression cylinder is at its uppermost limit of travel. As each sheet is deposited thereon the transfer table moves downwardly with the impression cylinder, as the latter reverses its direction of travel and moves on its idle or non-printing stroke, and until it reaches its lowermost position. As the transfer table approaches the end of its downward stroke it assumes an angular position as indicated in broken lines, in FIGURE 1, so as to present the leading or gripper edge of the sheet in register to the impression cylinder grippers 32. As the cylinder reverses its direction of travel, drive mechanism, not shown, is engaged and the cylinder is rotated at the same peripheral speed and in the same direction as the oppositely moving form to print an impression upon the sheet of paper carried on the cylinder. Simultaneously, the transfer table returns to its horizontal position to receive the next sheet from the separators 26.

As the cylinder comes to rest at the end of its printing stroke, the leading edge of the printed sheet is released by the cylinder grippers and engaged by delivery grippers 33 which convey the sheet to the delivery table 34. A series of these delivery grippers are mounted for oscillating motion between the impression cylinder and the delivery table and are arranged in spaced relation on a transverse shaft 36 mounted between the free ends of the delivery arms 37 and 38. These arms in turn are secured in spaced relation on a hollow supporting shaft 39 which is rotatably mounted in the side frame members 12 and 13.

It will be understood that suitable control means are provided for actuating the delivery grippers whereby to take each sheet from the impression cylinder and to release the sheets as their leading edge approaches the front pile guides 41 for deposit unto the delivery pile.

From the description thus far it will be apparent that the movements of the feeder and delivery arms must be in precise timed relation with the reciprocating strokes of the impression cylinder so that a sheet to be printed will be deposited in register on the transfer table 27 precisely as the table reaches its sheet receiving position and so that the printed sheet on the impression cylinder will be engaged and removed by the delivery grippers as the cylinder reverses its direction of travel. Moreover, it is essential that the respective arms move smoothly through their oscillating cycle without excessive vibrations or shocks, particularly at the points of reversal, so that the separators 26 will consistently deposit each sheet in precise register on the table 27 and to preclude the possibility of the delivery grippers missing a sheet on the impression cylinder.

To accomplish the required smooth operation of the feeder and delivery mechanisms, the respective arms are arranged to be actuated by means of the open cams 42 and 43 which are coaxially mounted on a stub shaft 44 journalled for rotation in the frame member 12. The shaft 44, which is arranged to be rotated through one complete revolution for each cycle of operation, is driven by a gear 46 which is secured to said shaft and meshes with the main drive pinion 21. As it rotates with the shaft 44 the cam 42 imparts oscillating motion to the feeder arms 29 through a cam lever 47 secured to the end of the feeder arm supporting shaft 31 and which carries the cam follower roller 48. The cam 43 in turn, is arranged to impart relative oscillating motion to the delivery arms 37, 38 through the cam lever 49 which is fixed to the corresponding end of the delivery arm supporting shaft 39 and is provided with the cam follower roller 51. Thus, as the cams 42 and 43 are rotated through a complete revolution for each reciprocating cycle of the bed and cylinder, the feeder and delivery arms will be oscillated in timed relation therewith and in opposite directions with respect to each other.

Although the cams 42 and 43 are not precisely conjugate, they are nevertheless, constructed and arranged so as to impart substantially conjugate motion to the respective cam levers and associated mechanisms. Thus, although relatively extensive motion is imparted to the cam levers, in order to obtain the required travel of the feeder and delivery arms, the extent of relative motion between said levers is maintained at a minimum. This is an important feature which makes it possible to use a single relatively small, resilient member for maintaining the cam rollers in contact with their respective cams without danger of inducing excessive stresses therein which might exceed its modulus of elasticity.

Moreover, the limited relative motion between the cam levers, makes it possible to apply a minimum initial preload tension to the resilient member and which tension remains substantially constant throughout the cycle of operation. Thus the forces exerted against the cams are always equalized and substantially constant during the cycle of operation and wear of the coacting surfaces and on the cam shaft bearings is substantially reduced.

The force required to maintain the cam follower rollers 48 and 51 in contact with their respective cams and to effect the return motion of the feeder and delivery arms, is provided by means of a single resilient member or torsion bar 52. This member is coaxially mounted within the hollow delivery shaft 39, see FIGURE 3, and is formed with enlarged end portions 53 and 54 which are provided with axial splines or grooves. The splined end 53 of the torsion bar is inserted into corresponding grooves in the reduced neck portion 56 at one end of the shaft 39, whereas the opposite end 54 of said bar is fitted into a splined bore 57 formed in the lever 58. The lever 58 is clamped securely to the torsion bar and is rotatably mounted in the open end of shaft 39 by means of a laterally projecting collar or bearing portion 59 which is formed integral therewith. The free end of lever 58 is, in turn, connected to the cam lever 47 by means of the connecting rod 60.

Thus it will be evident that as the high part of cam 42 moves the cam lever 47 and therewith the feeder arms in counter-clockwise direction from the transfer table to the feed table, a force is exerted through the connecting rod 60 and lever 58 to the torsion bar 62 and thence through the shaft 39 to the cam lever 49 whereby to maintain roller 51 in contact with cam 43 and to effect the return movement of the delivery arms in clockwise direction from the impression cylinder to the delivery pile. Conversely, as the roller 51 rides over the high part of cam 43 to move the delivery arms in counter-clockwise direction from the delivery table toward the impression cylinder, a force is exerted through the lever 49 to shaft 39. thence through the torsion bar 52 to lever 58 and the connecting link 60 whereby to move cam lever 47 and therewith the feeder arms in clockwise direction from the feed table toward the impression cylinder.

It will be understood that, at assembly, an initial preload is applied to the torsion bar to maintain the cam followers against their respective cams and which will

provide sufficient tension to overcome the maximum acceleration forces exerted thereagainst.

As a safety feature to prevent damage to the feeder and delivery mechanisms and/or other operating elements of the press, a link 62 is provided whereby to limit the free movements of the feeder and delivery cam levers 47 and 49 in the event the torsion bar should weaken or fail. The link 62 is pivotally connected to the free end of lever 58 and is formed adjacent its opposite end with an elongated slot 63 to receive a pin 64 which is secured to the face of cam lever 49. The slot 63 is made long enough to permit maximum relative movement between levers 58 and 49 during normal operation of the press and during which time the pin 64 will slide back and forth in said slot. In the event the torsion bar should fail, however, the link 62, through coaction with pin 64 will function to limit the free motion of the respective cam levers 47 and 49 and maintain them and, thus the feeder and delivery mechanisms, substantially within their normal range of travel and in proper timed relation with the bed and cylinder until the press can be stopped.

While we have herein illustrated and described a torsion bar as the preferred means for maintaining tension on the respective cam levers, it will be appreciated that coil spring means may be used with substantially the same efficiency. Therefore, the invention is not to be limited to or by details of construction of the particular embodiment thereof illustrated in the drawings, as various other forms of the device will, of course, be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. In a printing press the combination comprising an impression cylinder, oscillating feed mechanisms for advancing sheets from a supply thereof to said cylinder, oscillating delivery mechanism for conveying the sheets from said cylinder to a delivery pile, a first rotatable shaft mounted at one side of said cylinder for supporting the feed mechanism, a second rotatable shaft mounted at the opposite side of said cylinder for supporting the delivery mechanism, a control lever fixed to each of said shafts; a pair of cams rotatably mounted intermediate said shafts for actuating said levers whereby to impart oscillating motion to said feed and delivery mechanisms, and a torsion bar connected between said levers, said torsion bar providing tension whereby to preload and maintain both of said levers against their respective cams.

2. In a printing press having an impression cylinder, oscillating feed mechanism for advancing sheets from a supply thereof to said cylinder, and oscillating delivery mechanism for conveying sheets from said cylinder to a delivery pile, the combination comprising a supporting shaft for said feed mechanism rotatably mounted at one side of said cylinder, a hollow, supporting shaft for said delivery mechanism rotatably mounted at the opposite side of said cylinder, a control lever fixed to each of said shafts, a pair of rotatable cams for actuating said levers respectively whereby to oscillate said feed and delivery mechanisms, said cams being coaxially mounted intermediate said shafts, resilient spring means coaxially mounted within said hollow shaft and having one end thereof fixed to said shaft, and means connected between the free end of said spring means and the feeder control lever, said resilient spring means providing the tension whereby both said control levers are preloaded and maintained against their respective cams.

3. In a printing press having an impression cylinder, oscillating feed mechanism for advancing sheets from a supply thereof to said cylinder, and oscillating delivery mechanism for conveying sheets from said cylinder to a delivery pile, the combination comprising a supporting shaft for said feed mechanism rotatably mounted at one side of said cylinder, a hollow, supporting shaft for said delivery mechanism rotatably mounted at the opposite side of said cylinder, a control lever fixed to each of said shafts, a pair of rotatable cams for actuating said levers respectively whereby to oscillate said feed and delivery mechanisms, said cams being coaxially mounted intermediate said shafts, a torsion bar coaxially mounted within said hollow shaft and having one end thereof fixed to said shaft, and means connected between the free end of said torsion bar and the feeder control lever whereby said torsion bar is effective to maintain both said control levers in intimate contact with their respective cams.

4. In a printing press having an impression cylinder, oscillating feed mechanism for advancing sheets from a supply thereof to said cylinder, and oscillating delivery mechanism for conveying the sheets from said cylinder to a delivery pile, the combination comprising a rotatable supporting shaft for said feed mechanism, a rotatable supporting shaft for said delivery mechanism, said latter shaft being hollow, a control lever fixed to each shaft, rotatable cam means for actuating said levers whereby to oscillate said feed and delivery mechanisms, a torsion bar mounted within said hollow shaft and having one end thereof secured to said shaft, a relatively movable lever mounted on the opposite end of said shaft and secured to the free end of said torsion bar, and a tie bar connected between the said movable lever and the feed control lever, said torsion bar providing tension whereby both of said control levers are preloaded and maintained against their respective cams.

5. In a printing press having feeder and delivery mechanisms mounted for oscillation in opposed relation, drive means for actuating said mechanisms comprising, a supporting shaft for the feeder mechanism, a cam lever fixed to said shaft, a supporting shaft for the delivery mechanism, a cam lever fixed to said latter shaft, a pair of rotary cams mounted for rotation about a common axis intermediate said shafts for actuating said levers respectively, and a single resilient member connected between said levers whereby a continuously equalized force is exerted against both of said levers to maintain them in contact with their respective cams, said cams being constructed and arranged in a manner that said levers are oscillated substantially in unison and in the same direction to thereby minimize the extent of relative motion therebetween and whereby the tension on said resilient member is maintained substantially constant.

6. In a printing press having feeder and delivery mechanisms mounted for oscillation in opposed relation, means for actuating said mechanisms comprising, a cam lever associated with each of said mechanisms, a pair of coaxially mounted rotary cams for actuating said levers respectively, said cams being adapted to move said levers in a manner whereby relative motion therebetween is maintained within predetermined limits, a single resilient member connected between said levers whereby a substantially constant, continuously equalized force is exerted against both of said levers to maintain them in contact with their respective cams, and safety means comprising a slotted bar connected between said levers to prevent relative motion of said levers beyond said predetermined limits.

7. In a printing press, the combination comprising an impression cylinder, oscillating feed means for advancing sheets from a supply thereof to said cylinder, oscillating delivery means for conveying the sheets from said cylinder to a delivery pile, mechanism including a pair of rotary, coaxial cams and coacting levers for oscillating said feeder and delivery means in opposed relation, and a single resilient spring member connected between said coacting levers for preloading and maintaining both of said levers against their respective cams.

8. In a printing press, the combination comprising an impression cylinder, oscillating feed mechanism for advancing sheets from a supply thereof to said cylinder, oscillating delivery mechanism for conveying the sheets from said cylinder to a delivery pile, a first rotatable

shaft for supporting the feed mechanism, a second rotatable shaft for supporting the delivery mechanism, a control lever fixed to each of said shafts, rotary cams for actuating said levers respectively whereby to impart oscillating motion to said feed and delivery mechanisms, said rotary cams being mounted for rotation about a common axis intermediate said first and second shafts, and a single resilient spring member connected between said levers whereby a substantially constant, equalized force is exerted on both of said levers to maintain them in contact with their respective cams.

References Cited in the file of this patent

UNITED STATES PATENTS

1,567,178	Cheshire	Dec. 29, 1925
1,609,585	Stevens	Dec. 7, 1926
2,027,797	Toppin	Jan. 14, 1936
2,276,269	Dudley	Mar. 17, 1942