

Sept. 7, 1965

F. M. SLAVIC
PRESS FOR WEB PRINTING HAVING INTERMITTENT
PAPER FEEDING MEANS

3,204,556

Filed May 25, 1964

10 Sheets-Sheet 1

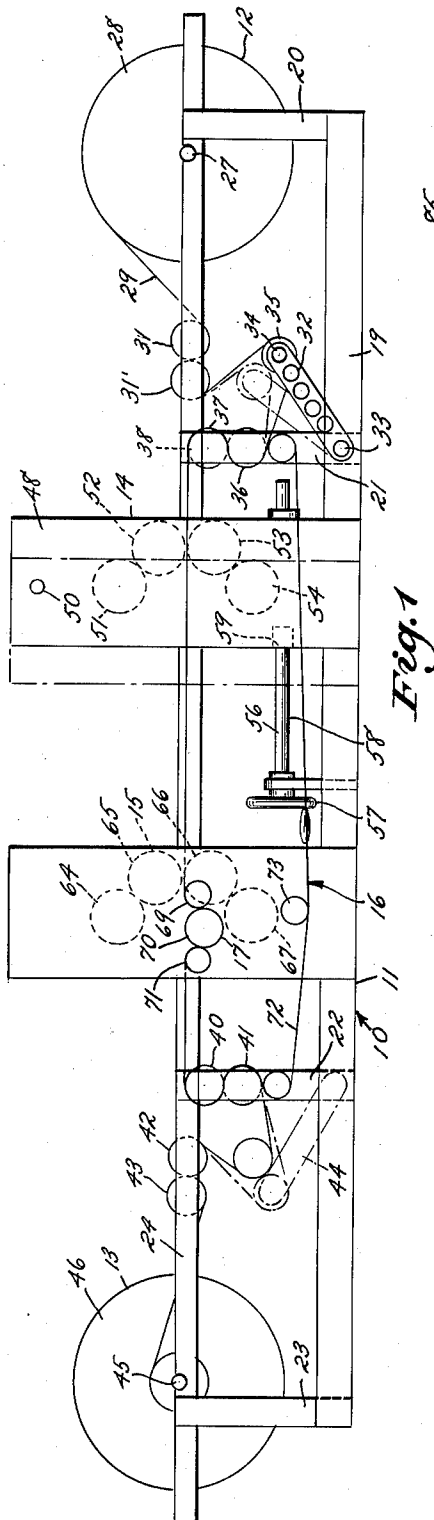


Fig. 1

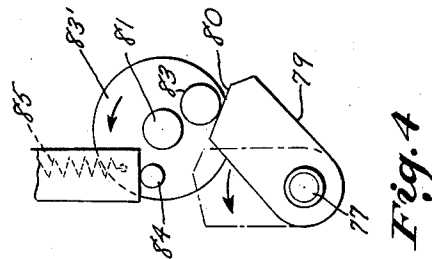


Fig. 4

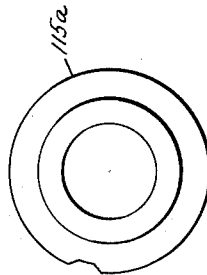


Fig. 5

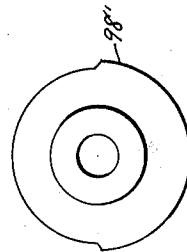


Fig. 6

Fig. 8

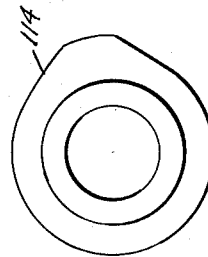


Fig. 7

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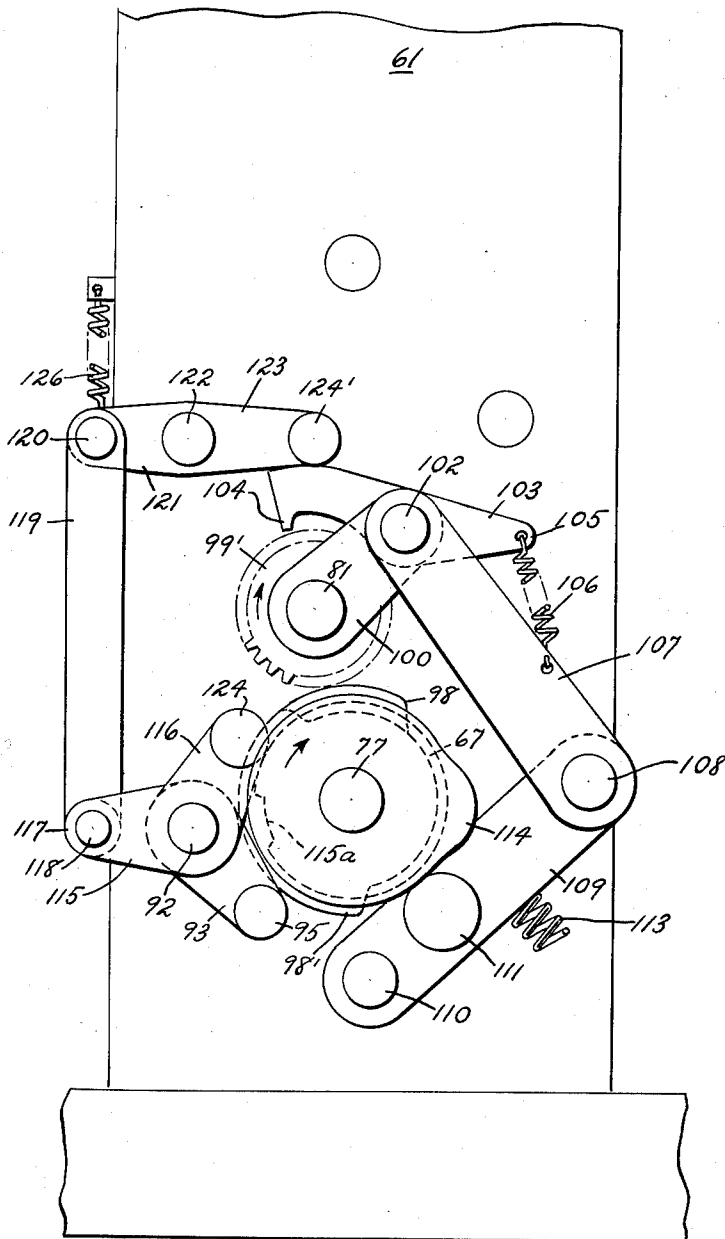
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Fig. 2



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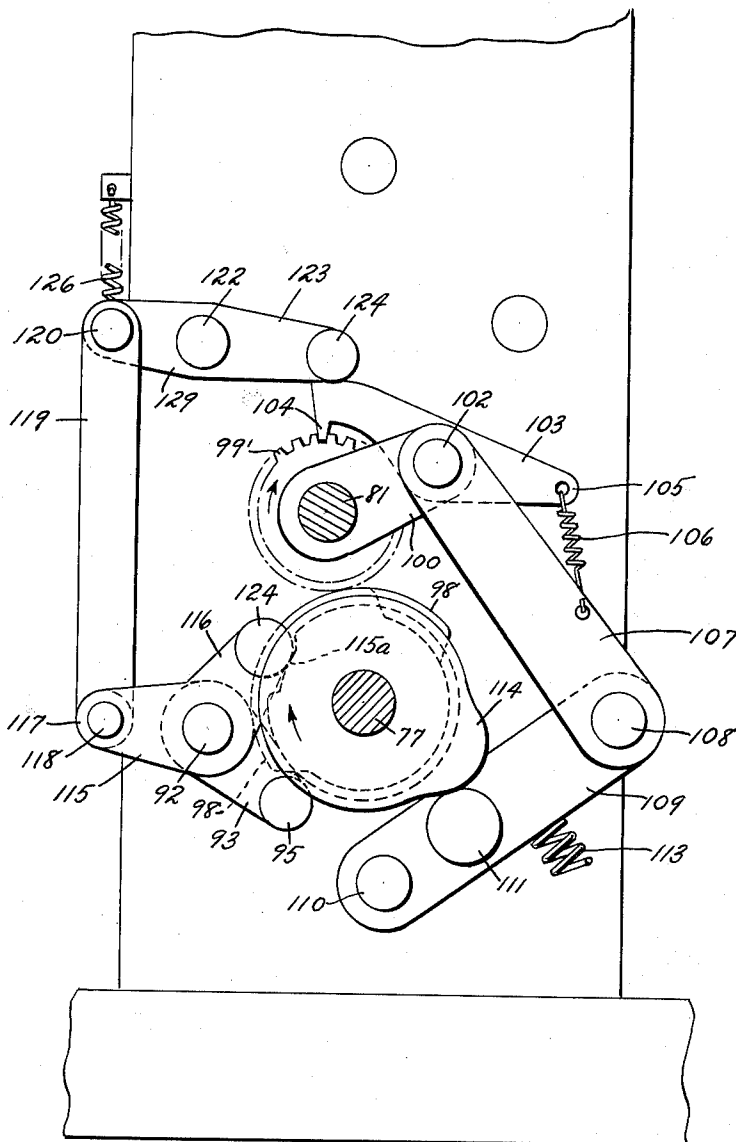
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Fig. 2A



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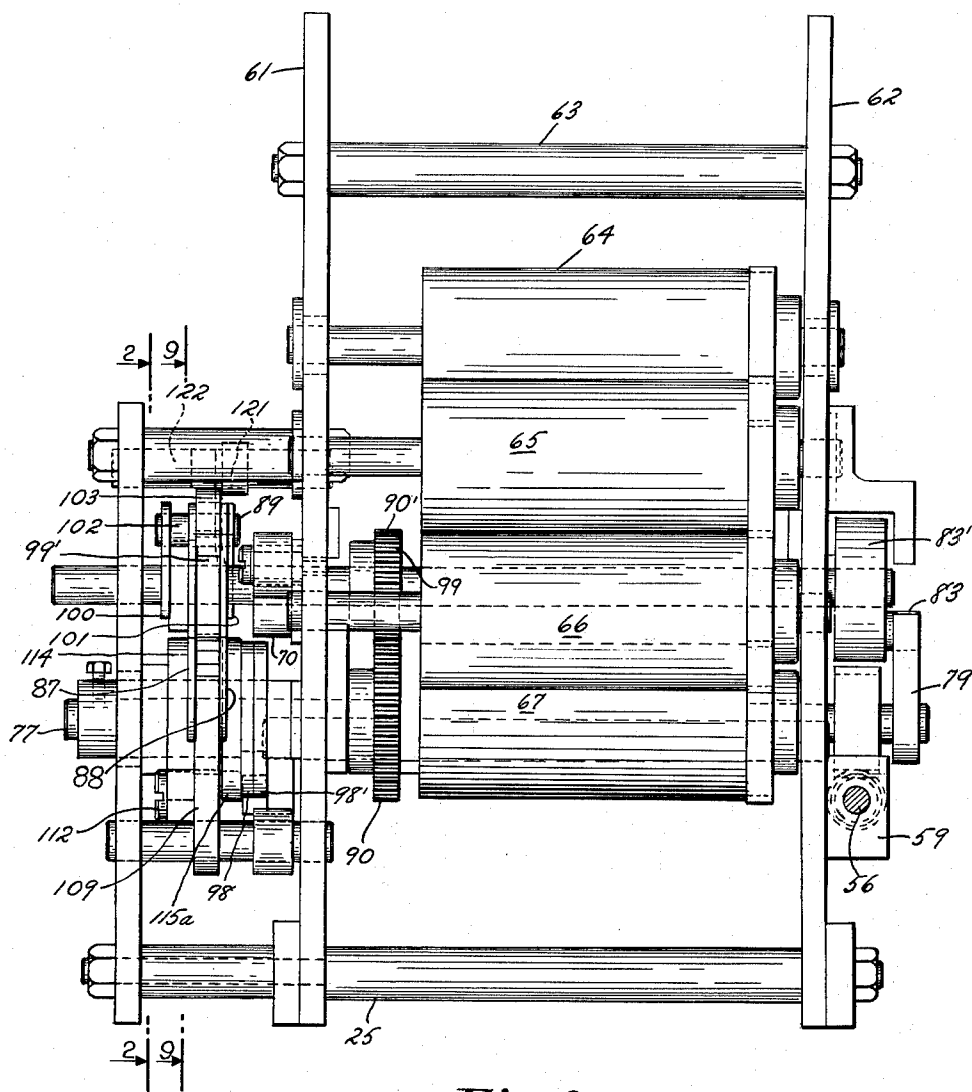


Fig. 3

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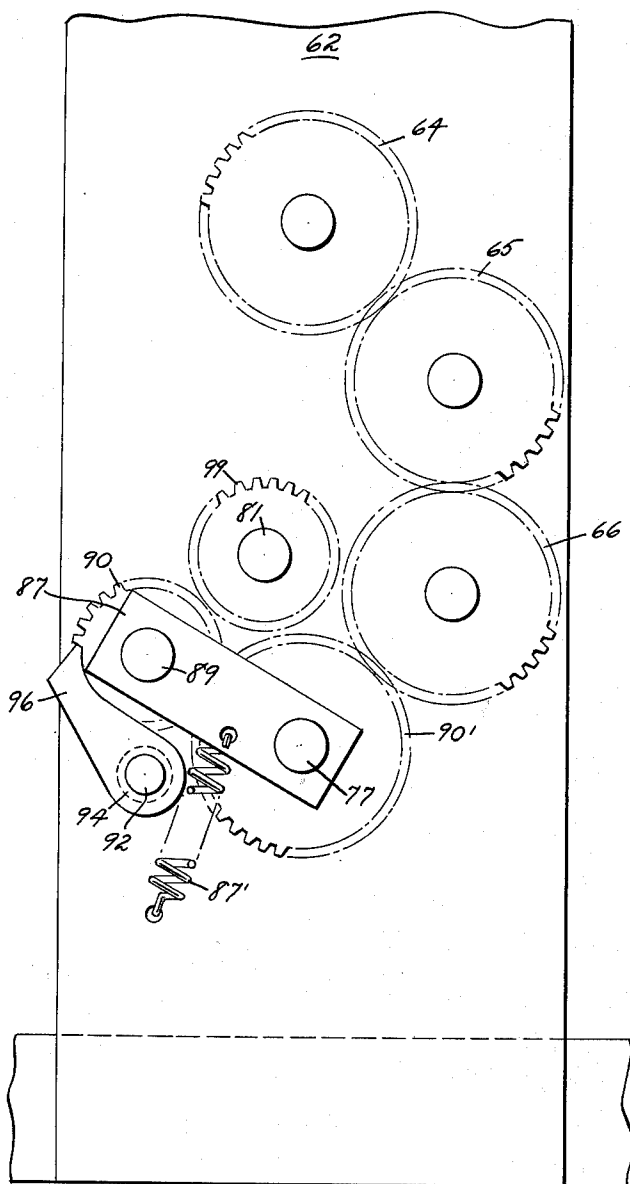
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Fig. 9



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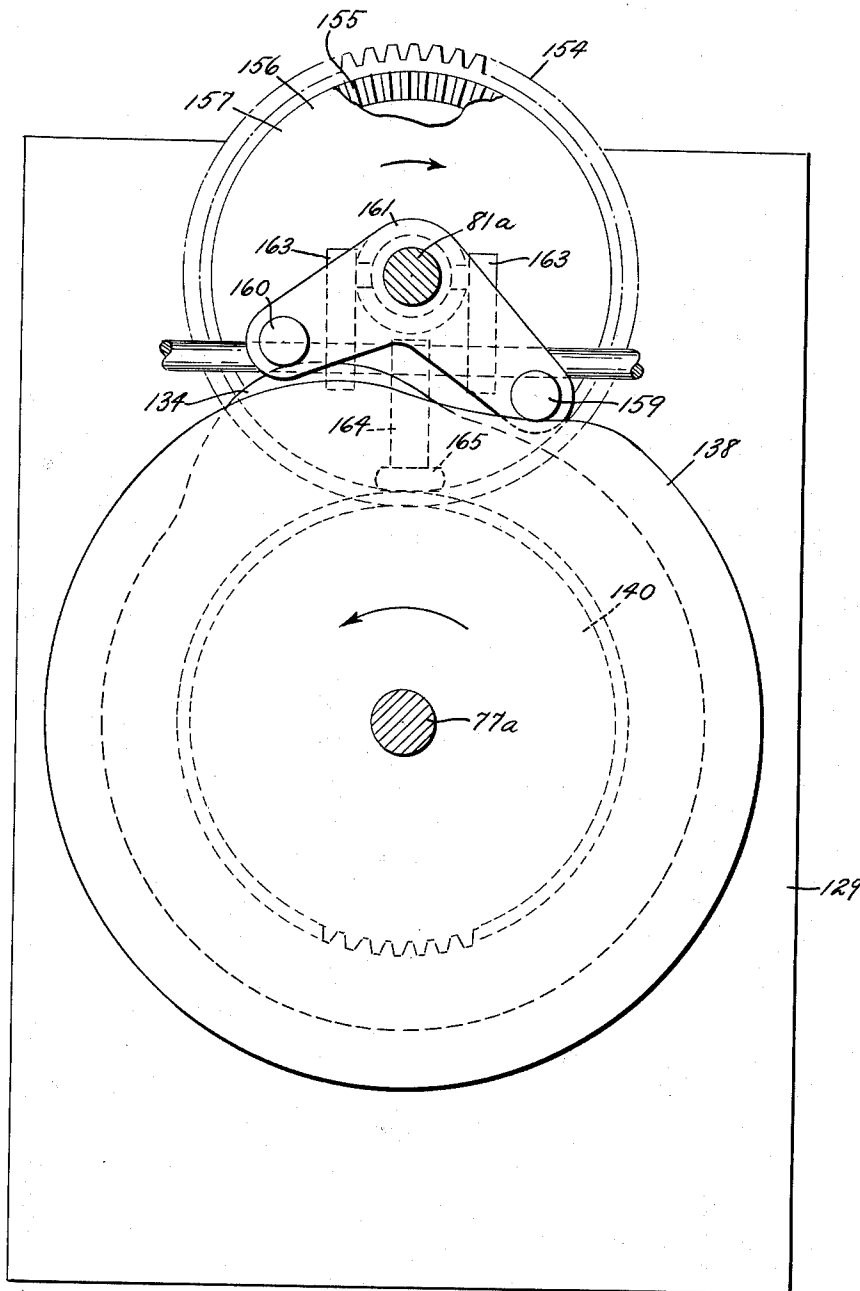
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Fig. 11



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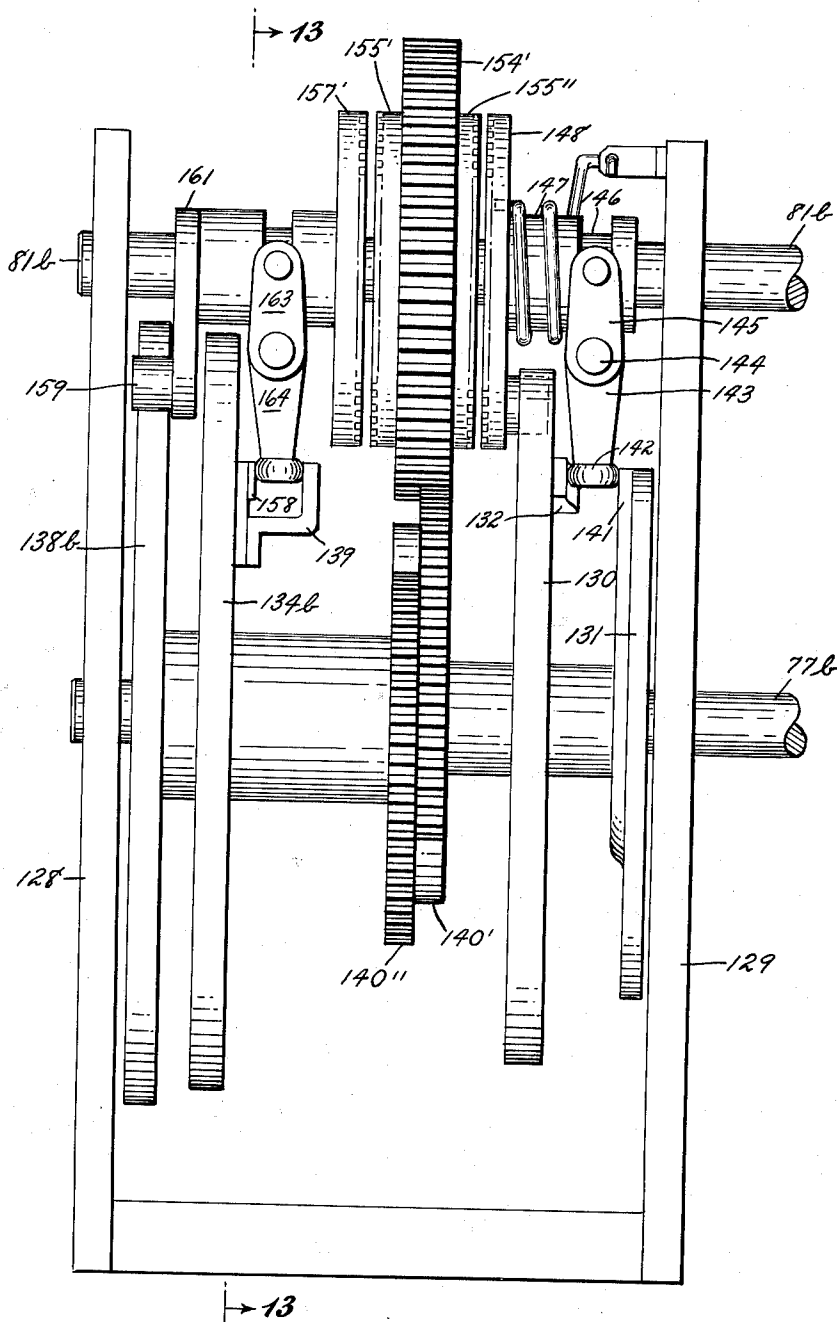
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Fig. 12



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Fig. 13

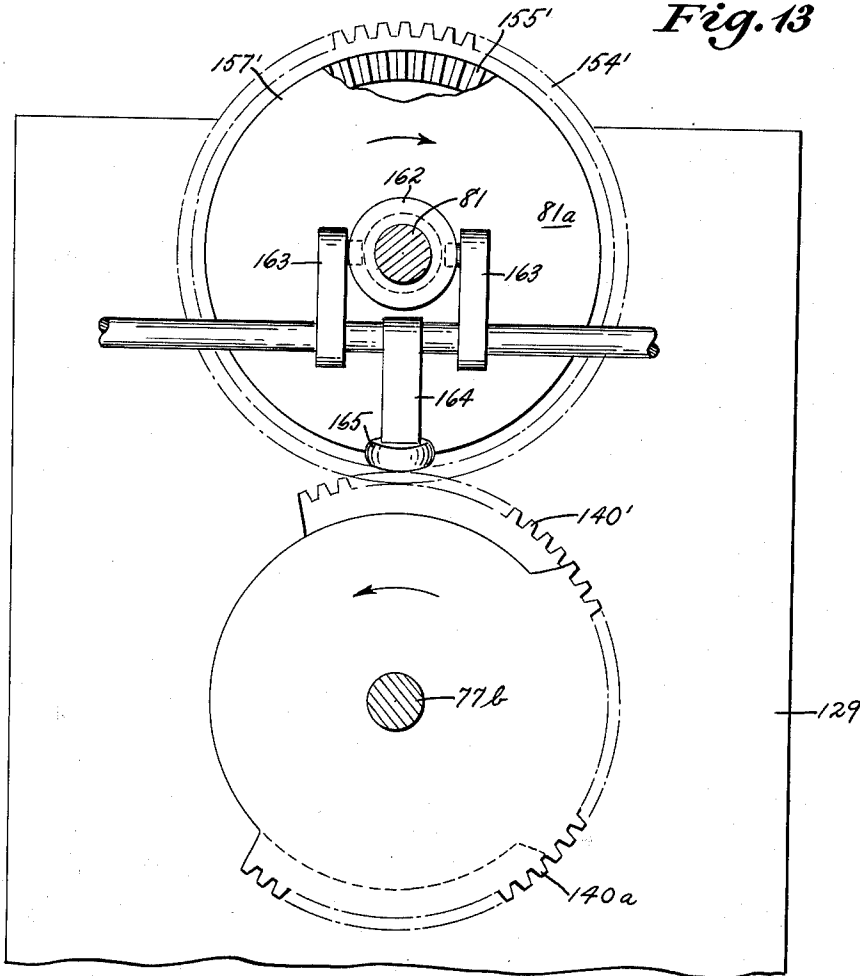
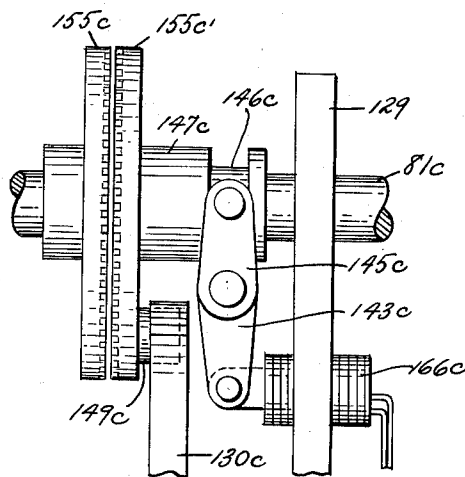


Fig. 16



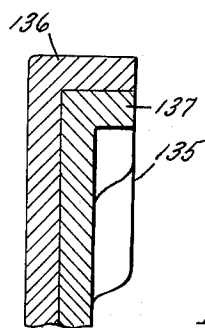
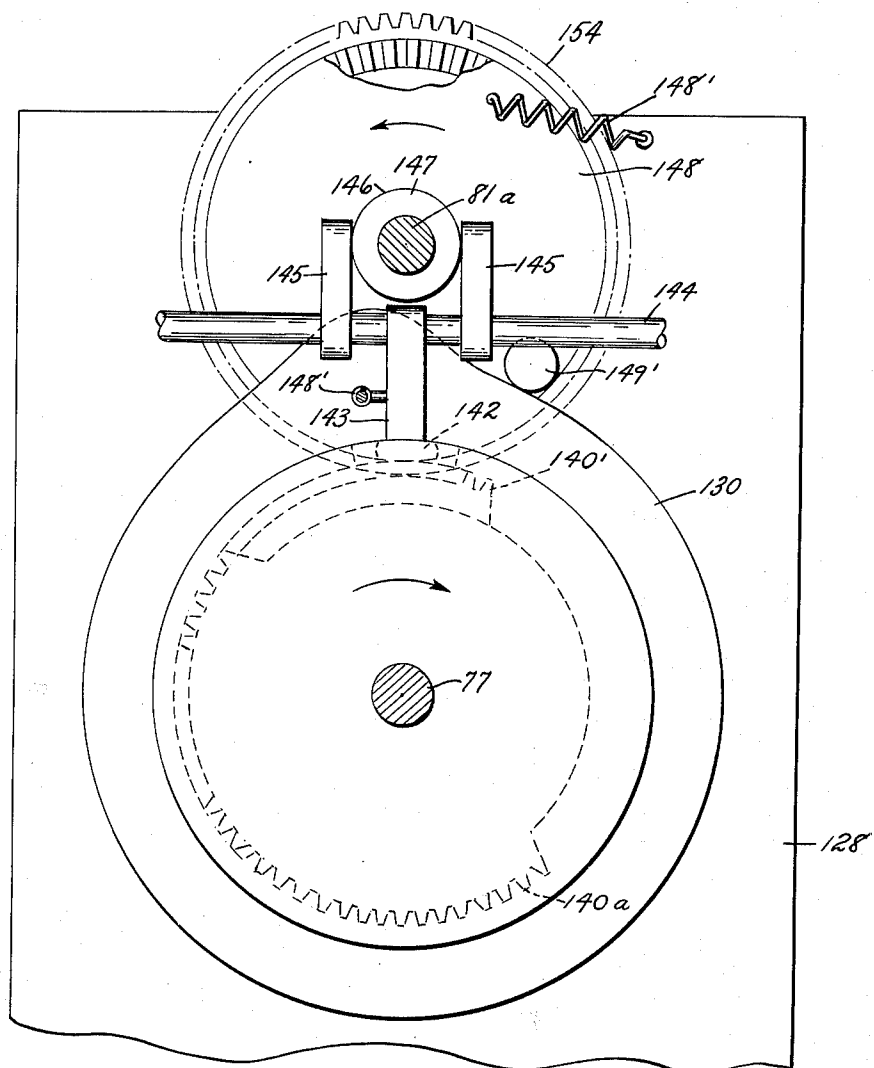
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PRESS FOR WEB PRINTING HAVING INTERMITTENT PAPER FEEDING MEANS

Fred M. Slavic, New Rochelle, N.Y., assignor to Flexitron Company, New York, N.Y., a partnership
Filed May 25, 1964, Ser. No. 372,139
6 Claims. (Cl. 101-228)

This application is a continuation-in-part to my co-pending application, Serial No. 105,329, filed April 25, 1961 under the same title, now abandoned.

This invention relates generally to the field of printing presses of the web type, and more particularly to improved means for conserving paper where images to be printed are of dimensions less than the developed length of the printing cylinders.

In the web type of printing press, paper is continuously fed from a roll past a number of printing stations, each of which includes one or more printing cylinders which print a single color of a multicolor image in superimposed relation. In most presses, the printing cylinder is of fixed diameter, and consequently its total printing area is a correspondingly fixed area. Where the particular image to be printed is of substantially less area, if the web of paper is fed continuously, a substantial wastage of paper will result. This is particularly serious in web type presses, where only long runs are usually made, and where the printed sheets are subsequently severed from the roll and cut down to the desired size.

It is known in the art, as disclosed in my co-pending United States patent application Serial No. 842,806, filed September 28, 1959, to feed the paper independently of the movement of the printing cylinders, and to accelerate mechanism moving the paper in conformance with the printing areas of the printing cylinders to obtain a smear-free impression. The mechanism for accomplishing this end is relatively complicated and not without problems of registration, that is the aligning of subsequent impressions upon those previously printed at an earlier printing station.

It is among the principal objects of the present invention to provide an improved form of press having intermittent paper feeding means in which the mechanism involved may be appreciably simpler than that heretofore known in the art, permitting the same to be built far more compactly, and at a lower cost, together with other advantages which naturally flow from the employment of a simplified mechanism.

Another object of the invention lies in the provision of an improved web feed press having intermittent paper feeding means in which the usual loops of paper existing between stations have been eliminated, thereby permitting the press to operate at extremely high speeds without difficulty.

Still another object of the invention lies in the provision of a printing press of the class described, and embodying the above described advantages, in which the paper advancement means may have relatively low rotational inertia as contrasted with prior art devices, thereby permitting the lightening and simplification of acceleration and deceleration mechanisms, with consequent higher speed of operation being possible.

Still another object of the invention lies in the provision of improved press construction which may be readily adjusted for the amount of feed of paper with respect to each revolution of the printing cylinders, so that the adjustment of the press at the time of changing runs is materially simplified.

A feature of the invention lies in the fact that all cams comprising parts of the embodiment are mounted upon a common hub to simplify adjustments thereof.

These objects and features, as well as other incidental ends and advantages, will more fully appear in the progress of the following disclosure, and be pointed out in the appended claims.

In the drawing, to which reference will be made in the specification, similar reference characters have been employed to designate corresponding parts throughout the several views.

FIGURE 1 is a side elevational view of an embodiment of the invention.

FIGURE 2 is an enlarged fragmentary side elevational view of one of the printing stations comprising a part of the embodiment, taken at section 2-2 in FIGURE 3.

FIGURE 2A is a similar fragmentary side elevational view, but showing certain of the components parts in altered relative position.

FIGURE 3 is a side elevational view as seen from the right hand portion of FIGURE 2.

FIGURE 4 is a fragmentary side elevational view as seen from the right hand portion of FIGURE 3.

FIGURES 5, 6, 7, and 8 are side elevational views showing profiles of certain cams comprising parts of the embodiment.

FIGURE 9 is a fragmentary sectional view as seen from the plane 9-9 in FIGURE 3, with certain of the component parts removed for the purpose of clarity.

FIGURE 10 is a fragmentary view in elevation showing an alternate form of the embodiment.

FIGURE 11 is a fragmentary sectional view as seen from the plane 11-11 in FIGURE 10.

FIGURE 12 is a fragmentary view in elevation showing a second alternate form of the embodiment.

FIGURE 13 is a sectional view as seen from the plane 13-13 in FIGURE 12.

FIGURE 14 is a sectional view as seen from the plane 14-14 in FIGURE 10.

FIGURE 15 is a fragmentary sectional view of a cam comprising a part of either alternate form.

FIGURE 16 is a fragmentary view in elevation showing an alternate form of meshing construction which may be used with either the alternate form of FIGURE 10 or FIGURE 12.

In accordance with the invention, the device, generally indicated by reference character 10, comprises: a frame element 11, paper web supply means 12, paper web take-up means 13, a first printing unit 14, a second printing unit 15, paper advancement means 16, and paper accelerating and decelerating means 17.

With reference to FIGURE 1, the frame element 11 may be of generally conventional construction, including a pair of parallel lower horizontal frame members 19, vertical parallel frame members 20, 21, 22 and 23, upper frame members 24, and a plurality of transverse members, one of which is indicated by reference character 25.

The paper web supply means 12 includes a feeding spindle 27 supporting a conventional roll of paper 28 from which depends a web of paper, generally indicated by reference character 29. Disposed leftwardly of the spindle 27, as seen in FIGURE 1, are first and second horizontally disposed rollers 31 and 31' which are supported for rotation between the upper frame members 24 directly above a pivotally mounted bar 32. The bar 32 describes orbital motion about an axis of rotation 33, and supports a roller 35 for rotation about an axis 34. Mounted between the vertical frame members 21 are first and second vertically disposed rollers 36 and 37, respectively, the periphery 38 of the roller 37 lying in the plane of the web 29 in which the printing operation is performed.

The paper web take-up means 13 is seen in FIGURE 1, and is generally symmetrically arranged with respect to the supply means 12. It includes first and second vertically disposed rollers 40 and 41, respectively, supported

between the vertical frame members 22. First and second horizontally disposed rollers 42 and 43, respectively, are supported between the upper frame members 24, and a pivotally mounted bar 44 corresponds to the bar 32. The take-up spindle 45 supports a take-up roll 46 which is preferably driven at substantially uniform speed by means (not shown) of conventional type. As is well known in the art, the take-up spindle 45 may also be intermittently driven by electric means controlled by the location of the bar 44 through a switch (not shown). The bar 44 serves as a dancer roller for the purpose of taking up slack in the web of paper which will occur at each revolution of the printing cylinders.

The first printing unit 14 includes first and second side wall members, one of which is indicated by reference character 48, the same being interconnected by transverse members one of which is indicated by reference character 50. As is conventional where the web 29 is printed on both surfaces simultaneously, the side wall members 48 include an upper plate cylinder 51, an upper blanket cylinder 52, a lower blanket cylinder 53, and a lower plate cylinder 54. Where means of printing other than conventional offset is performed, other suitable impression means may be provided, as the present invention contemplates application to rotogravure, direct rotary printing, and the like. Gear means (not shown) interconnects the cylinders 51-54 for rotation, also as is well known in the art. To provide for proper registry with respect to the second printing unit 15, an adjusting means 56 is provided, the same including a hand wheel 57 driving a threaded member 58 engaged in a correspondingly threaded member 59, to move the entire printing unit 14 longitudinally with respect to the second printing unit 15.

The second printing unit 15 is generally similar to the first printing unit 14, and includes first and second side wall members 61 and 62, top transverse members, one of which is indicated by reference character 63, a similar upper plate cylinder 64, upper blanket cylinder 65, lower blanket cylinder 66 and lower plate cylinder 67.

The paper advancement means 16 is incorporated into the second printing unit 15 and includes first, second and third band actuating rollers 69, 70 and 71, respectively.

To insure synchronism of the various above described rollers, a tensioned steel band 72 extends around drums on the feed rollers 36, 37, 40, 41. Tension is maintained by a tensioning roller 73. As will more fully appear, the paper advancement means is driven by the second printing unit 15, in conjunction with the paper accelerating means 17. The band 72 extends over rollers 69 and 71 and under roller 70 as seen in FIGURE 1.

The paper accelerating means 17 performs the function of imparting an accelerating motion to the paper advancement means 16 to bring it up to the speed of the printing cylinders by the time the impression commences, and subsequently to disconnect the paper advancement means and bring it to a rapid stop when the impression imparted by a single revolution of the printing cylinders has been completed.

Referring to FIGURES 2 and 3, the lower plate cylinder 67 is supported upon a transversely disposed shaft 77, which may be driven by a prime mover (not shown). The right hand end of the shaft 77 (see FIGURE 4) is provided with a rotating cam member 79 having a generally planar cam face 80 on the free end thereof. The second band actuating roller 70 is similarly mounted upon a shaft 81 disposed in paralleled relation with respect to the shaft 77, the right-hand end being provided with a pintle-like cam follower 83 on an overrunning clutch member 83'. To position the follower 83 within the path of the cam face 80, stop means 84 cooperates with a spring 85 connected to the clutch member 83' which normally returns the axial position of the shaft 81 to that seen in FIGURE 4 for the commencement of a single printing cycle.

As best seen in FIGURES 3 and 9, the shaft 77 mounts

a pair of radius arms 87 and 88 which are interconnected at the free ends thereof by a shaft 89. A spring 87' urges the arm 87 in a counter-clockwise direction as seen in FIGURE 9. A gear 90 is supported upon the shaft 77. As seen in FIGURES 2 and 9, immediately leftward of the gear 90' is a rocker arm shaft 92 which mounts a rocker arm 93 for pivotal movement about a bearing 94. The rocker arm 93 includes a cam follower portion 95 and an actuating portion 96. An actuating cam 98 turns with the shaft 77 to impart clockwise motion to the rocker arm 93.

At this point in the disclosure, the acceleration of the paper advancement means 16 will be described. At the commencement of each rotation of the printing cylinders, the cam member 79 strikes the cam follower 83 to impart a rapid accelerating movement in a counterclockwise direction as seen in FIGURE 4. By the time the cam face 80 has passed the follower 83, the shaft 81 will be rotating at a speed somewhat greater than the angular velocity of the shaft 77, but at an identical angular velocity with the shaft 89 permitting smooth engagement of gear 99 with the gear 90. At this point the cam 98 (see FIGURE 5), which includes an adjustable member 98' for varying its effective length, contacts the cam follower portion 95 causing rotation of the rocker arm 93 and actuating portion 96 which act upon the radius arm 87 to move the gear 90 on the shaft 89 into meshing relation with gear 99. At this point, the commencement of printing takes place, and continues for so long a time as the above-mentioned gears remain in engagement. Once the cam member 79 has passed the cam follower 83, the contraction of the spring 85 causes rotation of the outer housing of the overrunning clutch 83' in a counterclockwise direction, as seen in FIGURE 4, until the stop means 84 is engaged, the overrunning clutch 83' transmitting motion to the shaft 81 only in a counter-clockwise direction, as seen in FIGURE 4.

Referring to FIGURE 2, the shaft 81 also supports a pair of radius arms 100 and 101, including a connecting pintle 102 which supports a pivotally mounted pawl member 103. The pawl member includes an engagement portion 104, and an oppositely disposed portion 105 having a spring 106 normally urging the same in a clockwise direction as seen in FIGURE 2. Connected to the pintle 102 is a link member 107 having a pintle 108 at the lower end thereof by means of which it is interconnected with a second link member 109 which is pivotally mounted at its lower end on a pintle 110. A cam follower 111 is mounted for orbital movement between the ends of the link member 109, and is moved by a cam 114. The link 109 is connected to a spring 113, the purpose of which is to maintain follower 111 at all times in contact with cam 114. The follower 111 is periodically engaged by the cam 114 so that through links 109 and 107, the link 103 is accelerated in a clockwise direction around the gear 99', until it has obtained the same angular velocity as the gear.

Referring again to the shaft 92, a second rocker arm 115 is provided, including a cam follower portion 116 and an actuating portion 117 having a pintle 118 thereon. The rocker arm 115 is operated by a cam 115a (see FIGURE 8) which contacts a roller 124 on the cam follower portion 116 to provide a clockwise motion as seen in FIG. 2. The leftward portion 117 of the arm 115 imparts upward motion as seen in FIGURE 2 to an elongated link 119, and through a pintle 120, to a generally horizontally arranged rocker arm 121 pivoting about an axis 122. The actuating portion 123 of the rocker arm 121 is provided with a roller 124' bearing upon the upper surface of the pawl member 103.

Referring now to FIGURE 2A, at the moment when the pawl member 103 has attained the angular velocity of gear 99', the low portion on the cam 115a permits the rocker arm 116 to move in a clockwise direction under the action of spring 126, which in turn moves link 123,

in a clockwise direction and forces engaging member 124 into mesh with gear 99'. At the same time adjustable cam 98', acting through links 93, 95, and 87, permits the gear 90' to swing in a counter-clockwise direction out of mesh with gear 99. Control of shaft 81 is now held by member 104 meshed in gear 99', and continued rotation of cam 114 acts to decelerate the clockwise motion of link 103 to a stop, thereby stopping gear 99' and shaft 81. When shaft has stopped, cam 115a acts to withdraw member 104 from gear 99'. At this point, the stop means 84 and springs 85 have returned the means 16 to position for the commencement for the next cycle.

It will be noted that cams 98', 115a, and 114 are mounted on a common hub. Thus one angular adjustment of all three cams regulates the point at which deceleration takes place. This in turn determines the length of the printed image.

From a consideration of FIGURE 1 it will be readily understood by those skilled in the art that as many additional printing units (not shown) may be employed as desired. Upper blanket cylinders 52 and 65 have removable segments on the non-printing portion of their periphery so as to release the pressure on the paper during the time that the web is stopped.

Referring now to the first alternate form of the embodiment illustrated in FIGURES 10 and 11, parts corresponding to those of the principle form have been designated by similar reference characters with the additional suffix a.

In accordance with the first alternate form, the shaft 77a rotates in bearings mounted on plates 128 and 129. Mounted on the shaft 77a are accelerating cams 130 and 131, carrying cam blocks 132 and 141 to impart sidewise motion to a follower 142, and through links 143 and 145 to band 146 and hub 147 to result in moving the serrated disc 148 axially along the shaft 81a. When the disc 148 is urged leftwardly, it engages teeth in a serrated disc 149 which is fixed to the shaft 81a. Also mounted on shaft 77a is an adjustable cam 135 including cupped discs 136 and 137 (see FIGURE 15) and a cam section 133. The cam 135 serves to laterally move the gear 154 through band 153, links 152 and 151, and the follower 150. The inner ring of the cam 137 is fixed on the shaft 77a, while the outer ring 136 and section 133, are angularly adjustable on said shaft so as to regulate the length of the arc which urges gear 154 leftwardly. The serrated ring 155 is mounted on gear 154, so that leftward movement of gear 154 moves the ring 155 into mesh with the serrated disc 156 which is fixed to the shaft 81a. Cams 136, 137, 134, 138, and gear 140 are mounted on a common hub on the shaft 77a, so that one angular adjustment with respect to the shaft positions all of the same. Decelerating cams 134 and 138 act in cooperation upon followers 159 and 160 to periodically impart clockwise motion (see FIGURE 11) to the follower 161 and serrated disc 157, as well as a return motion. The cam blocks 139 and 158 which are mounted on cam 134 impart lateral motion to the serrated disc 157 through band 162, links 163 and 164, and follower 165.

At the beginning of a given cycle, shaft 81a is stationary. Referring to FIGURES 10 and 14, the cam block 132 acting through links 143, 145, and 146, moves the disc 148 leftward into mesh with disc 149. Immediately the lobe on cam 130 moves the follower 149' mounted on the disc 148 counterclockwise, as seen from the right hand portion of FIGURE 10, thereby accelerating the shaft 81a up to the angular velocity of shaft 77a, since the disc 149 is fixed to the shaft 81a. At this point, cam block 141 acts to disengage discs 148 and 149, and the follower 149' returns the disc 148 to its former position through a spring 148'. At the moment that disc 149 has been brought to the proper velocity, and disconnected from disc 148, the cam 135 acts to force gear 154, and with it serrated ring 155, into mesh with serrated disc 156 which is fixed on the shaft 81a. Since the gear 154

meshes with the gear 140, both shafts are now meshed into geared relation with each other. It will be noted that gear 140 is fixed to shaft 77a and is always meshed with gear 154, so that both turn continuously.

Referring now to FIGURES 10 and 11, at the designated point in the cycle, cams 134 and 138 cooperate to accelerate in said clockwise direction link 161 and serrated disc 157. At the moment when the velocities of disc 157 and disc 156 are equal, cam blocks 139 and 158 act to force disc 157 rightward into mesh with disc 156, while at the same time cam 133 urges gear 154 and ring 155 rightward out of mesh with disc 156. Angular motion of disc 156 and with it shaft 81a is now controlled by cams 134 and 138, which now act to decelerate link 161 to a stop, at which instant cam blocks 139 and 158 act to retract disc 157 from disc 158.

A useful variation to this motion can be achieved by timing cam blocks 139 and 158 so as not to release disc 157 from disc 156 until the cam follower link 161 returns to its original counter-clockwise position. This has the effect not only of stopping the shaft 81, but of reversing it for a short distance after each printing cycle, enabling successive printed images to butt up against each other with no wasted paper in between.

Image size is accomplished by varying the point at which deceleration takes place. As mentioned hereinabove, all of the pertinent cams are mounted upon a common hub, so that only one angular adjustment is necessary.

Referring to FIGURE 12, an alternate method of meshing the main gears is disclosed, in which the driven gear 154' is fixed to shaft 81b, and carries serrated rings 155' and 155'' fixed on either side thereof. Shaft 77b carries two half gears 140' and 140'', the half gear 140' being fixed directly to the shaft 77b, and the half gear 140'' being fixed to a common hub with decelerating cams 134b and 138b. Angular adjustment of gear segment 140'' with relation to segment 140' therefore changes the effective length of gear segment which meshes with gear 154'. The effect of meshing and unmeshing shafts 77b and 81b is therefore accomplished in the same way as previously described by means of cam 35, links 151, 152, 153, etc., or by disengaging gears 90 and 99 as shown in FIGURE 9 in the principal embodiment.

Referring to FIGURE 16, there is shown an alternate method of shifting the serrated ring 155c and 155c' by means of a solenoid 166, a system which is suitable where the device is operated at relatively low speeds. Electrical switches (not shown) are operated by cams.

I wish it to be understood that I do not consider the invention limited to the precise details of structure shown and set forth in this specification, for obvious modifications will occur to those skilled in the art to which the invention pertains.

I claim:

1. In a printing press unit having a printing cylinder and a feed roller for advancing a web of paper for an adjustable distance to said printing cylinder, the improvement comprising: first means for imparting positive angular acceleration to said feed roller up to the surface speed of said printing cylinder, second means for positively maintaining said surface speed of said feed roller for an adjustable period of angular displacement, and third means for positively decelerating said feed roller to a stop; said first means including a first shaft continuously rotating at the same speed as said printing cylinder, a second shaft adjacent said first shaft and connected to said feed roller, a first cam on said first shaft, cam follower means, and clutch means interconnecting said cam follower means and said second shaft; said second means including means for interconnecting and disconnecting said first and second shafts in geared relationship; said third means including an engaging member, a second cam for accelerating said engaging member up to the speed of said first shaft, and a third cam

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for engaging said engaging member with said feed roller; continued rotation of said second cam serving to decelerate said feed roller, during which said second means disconnects said geared relationship.

2. In a printing press unit having a printing cylinder and a feed roller for advancing a web of paper for an adjustable distance to said printing cylinder, the improvement comprising: first means for imparting positive angular acceleration to said feed roller up to the surface speed of said printing cylinder, second means for positively maintaining said surface speed of said feed roller for an adjustable period of angular displacement, and third means for positively decelerating said feed roller to a stop; said first means including a first shaft continuously rotating at the same speed as said printing cylinder, a second shaft adjacent said first shaft and connected to said feed roller, a first cam on said first shaft, cam follower means, and clutch means interconnecting said cam follower means and said second shaft; said second means including a second cam for interconnecting and disconnecting said first and second shafts in geared relationship; said third means including an engaging member, a third cam for accelerating said engaging member up to the speed of said first shaft, and a fourth cam for engaging said engaging member with said feed roller; continued rotation of said third cam serving to decelerate said feed roller, during which said second means disconnects said geared relationship.

3. In a printing press unit having a printing cylinder and a feed roller for advancing a web of paper for an adjustable distance to said printing cylinder, the improvement comprising: first means for imparting positive angular acceleration to said feed roller up to the surface speed of said printing cylinder, second means for positively maintaining said surface speed of said feed roller for an adjustable period of angular displacement, and third means for positively decelerating said feed roller to a stop; said first means including a first shaft continuously rotating at the same speed as said printing cylinder, a second shaft adjacent said first shaft and connected to said feed roller, a first cam on said first shaft, cam follower means, and clutch means interconnecting said cam follower means and said second shaft; said second means including a second cam for interconnecting and disconnecting said first and second shafts in geared relationship; said third means including an engaging member, and a third cam for accelerating said engaging member up to the speed of said first shaft, and a fourth cam for engaging said engaging member with said feed roller, continued rotation of said second cam serving to decelerate said feed roller, during which said second means disconnects said geared relationship; said second, third and fourth cams being disposed on said first shaft, in mutually angularly adjustable relationship.

4. In a printing press unit having a printing cylinder and a feed roller for advancing a web of paper for an adjustable distance to said printing cylinder, the improvement comprising: first means for imparting positive angular acceleration to said feed roller up to the surface speed of said printing cylinder, second means for positively maintaining said surface speed of said feed roller for an adjustable period of angular displacement, and third means for positively decelerating said feed roller to a stop; said first means including a first shaft continuously rotating at the same speed as said printing cylinder, a second shaft adjacent said first shaft and connected to said feed roller, a first cam on said first shaft, cam follower means, and clutch means interconnecting said cam follower means and said second shaft, said second

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ond means including means for interconnecting and disconnecting said first and second shafts in geared relationship; said third means including an engaging member, a second cam for accelerating said engaging member up to the speed of said first shaft, and a third cam for engaging said engaging member with said feed roller; continued rotation of said second cam serving to decelerate said feed roller, during which said second means disconnects said geared relationship; said second, and third cams being disposed on said first shaft, in mutually angularly adjustable relationship.

5. In a printing press unit having a printing cylinder and a feed roller for advancing a web of paper for an adjustable distance to said printing cylinder, the improvement comprising: first means for imparting positive angular acceleration of said feed roller up to the surface speed of said printing cylinder, second means for positively maintaining said surface speed of said feed roller for an adjustable period of angular displacement, and third means for positively decelerating said feed roller to a stop; said first means including a first shaft continuously rotating at the same speed as said printing cylinder, a second shaft adjacent said first shaft and connected to said feed roller, a first cam on said first shaft, cam follower means, and clutch means interconnecting said cam follower means and said second shaft; said second means including means for interconnecting and disconnecting said first and second shafts in geared relationship; said third means including an engaging member, a second cam for accelerating said engaging member up to the speed of said second shaft, and fourth means for engaging said engaging member with said feed roller; continued rotation of said second cam serving to decelerate said feed roller, during which said second means disconnects said geared relationship.

6. In a printing press unit having a printing cylinder and a feed roller for advancing a web of paper for an adjustable distance to said printing cylinder, the improvement comprising: first means for imparting positive angular acceleration of said feed roller up to surface speed of said printing cylinder, second means for positively maintaining said surface speed of said feed roller for an adjustable period of angular displacement, and third means for positively decelerating said feed roller to a stop, and reversing it for a portion of its forward motion; said first means including a first shaft continuously rotating at the same speed as said printing cylinder, a second shaft adjacent said first shaft and connected to said feed roller, a first cam on said first shaft, cam follower means, and clutch means interconnecting said cam follower means and said second shaft; said second means including means for interconnecting and disconnecting said first and second shafts in geared relationship; said third means including an engaging member, and a second cam for accelerating said engaging member up to the speed of said second shaft, and fourth means for engaging said engaging member with said feed roller; continued rotation of said second cam serving to decelerate, stop, and partially return said feed roller, during which said second means disconnects said geared relationship.

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