June 1, 1954 R. W. BAILEY 2,679,799

PAPER FEED MECHANISM FOR DUPLICATING MACHINES AND THE LIKE

Filed Oct. 5, 1949 7 Sheets-Sheet 1

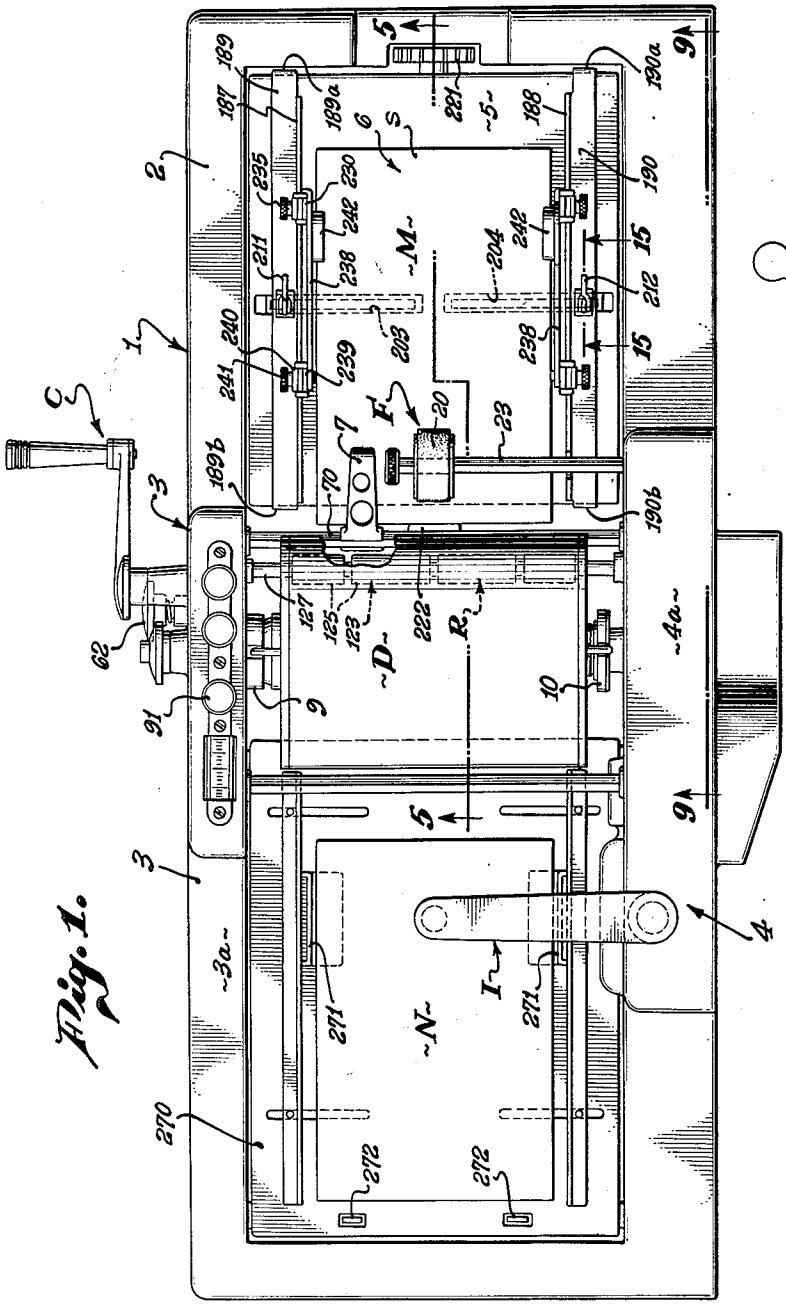


Fig. 1.

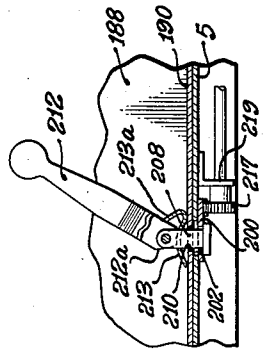


Fig. 15.

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PAPER FEED MECHANISM FOR DUPLICATING MACHINES AND THE LIKE

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Fig. 2.

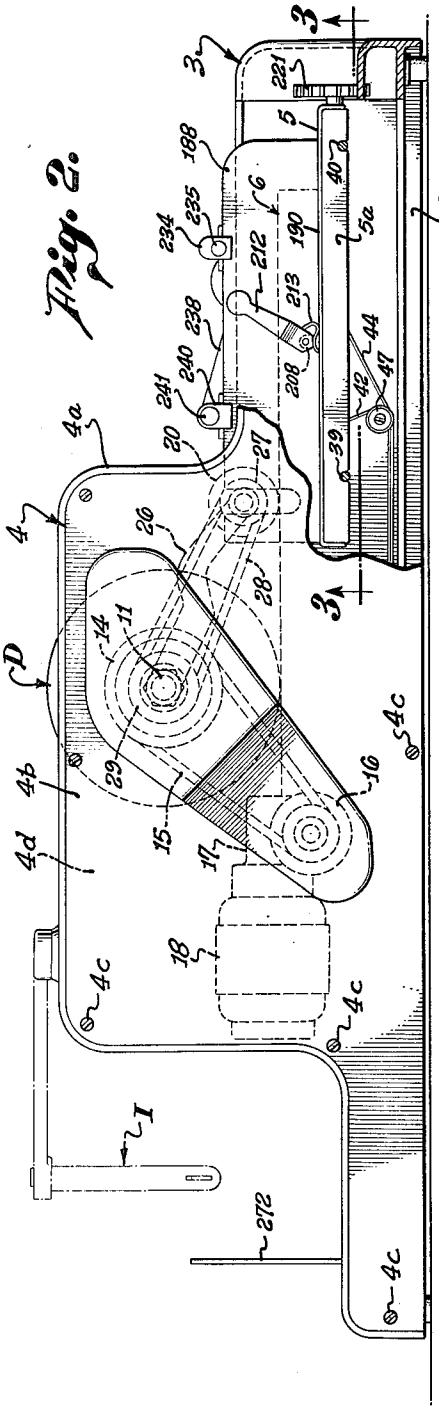


Fig. 4.

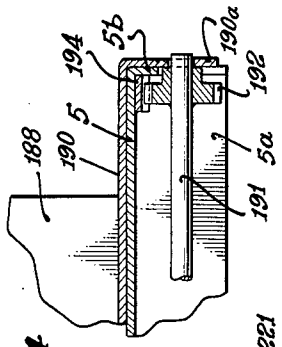
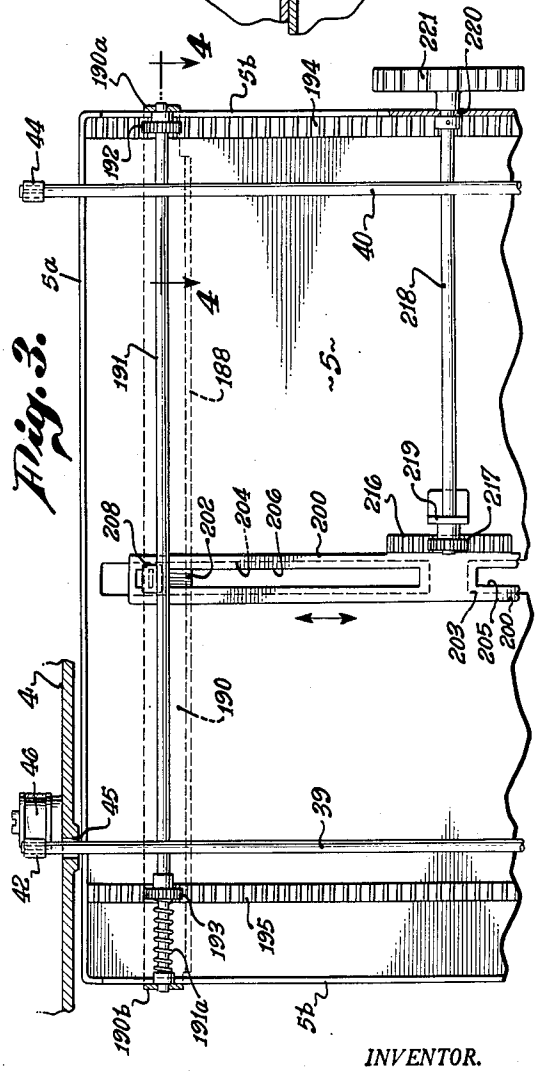


Fig. 3.



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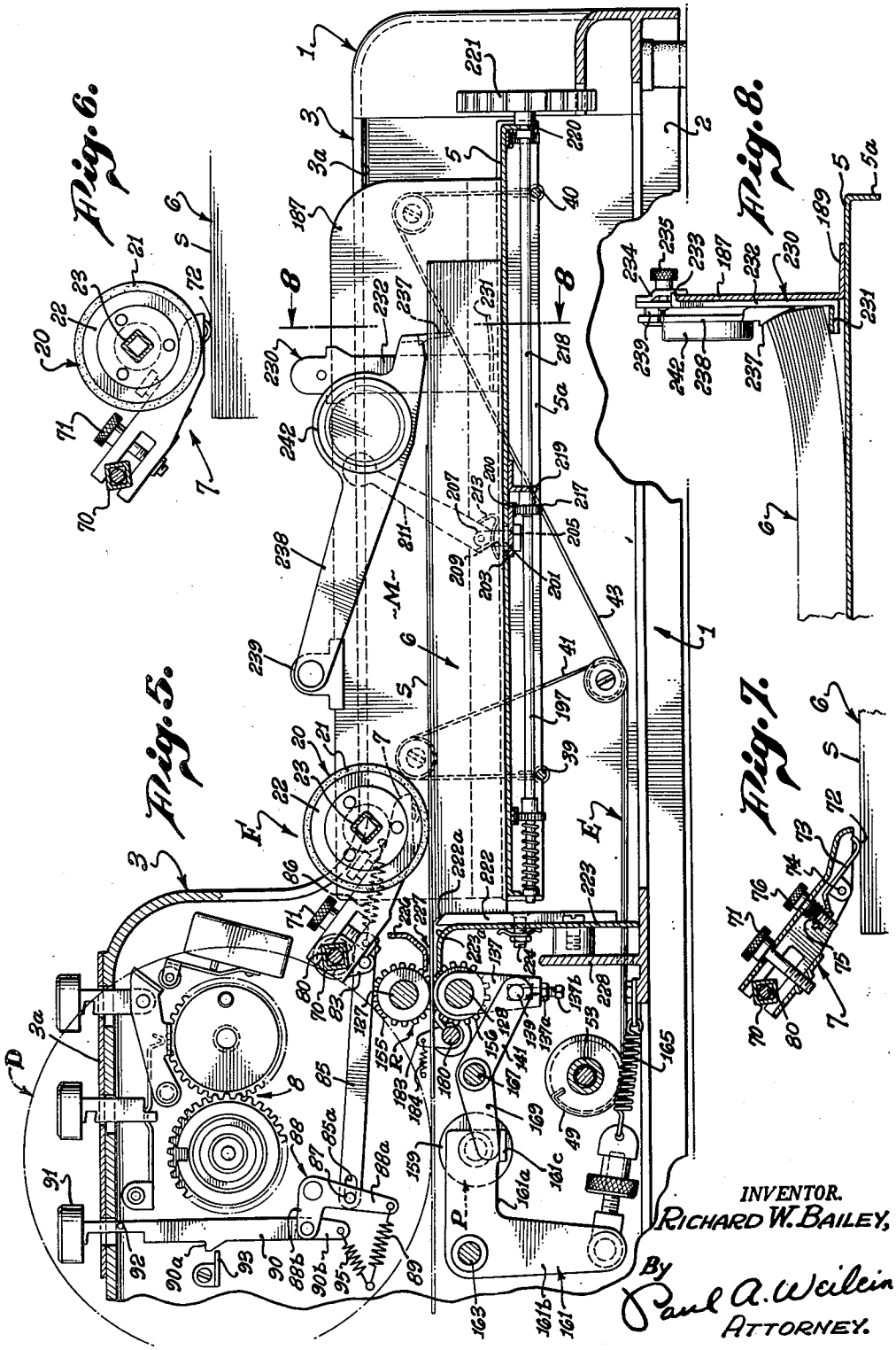


Fig. 6.

Fig. 8.

Fig. 5.

Fig. 7.

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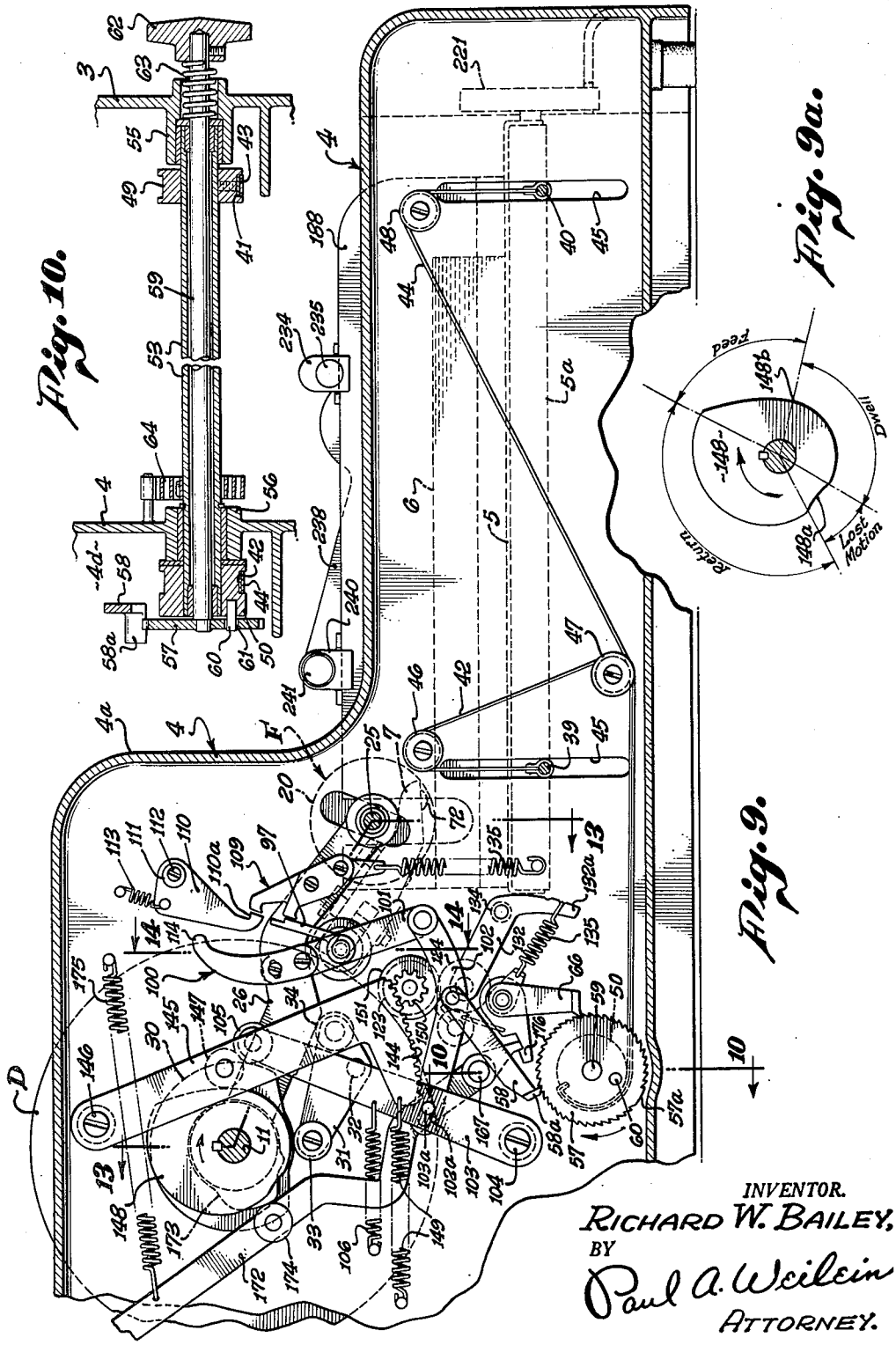


Fig. 10.

Fig. 9a.

Fig. 9.

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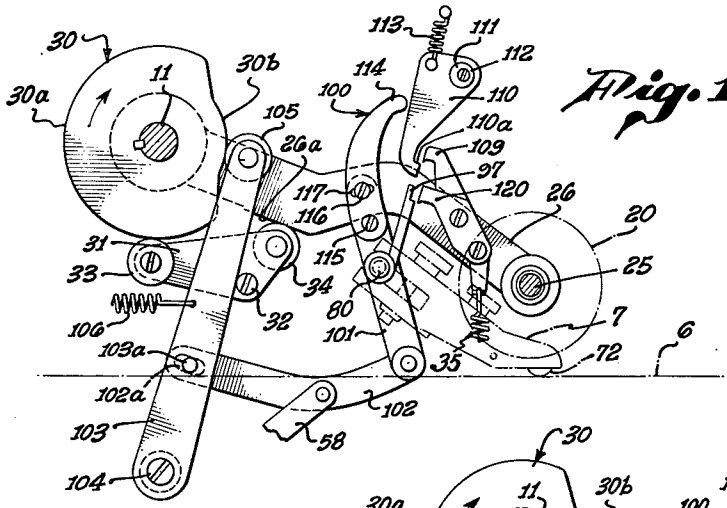


Fig. 11.

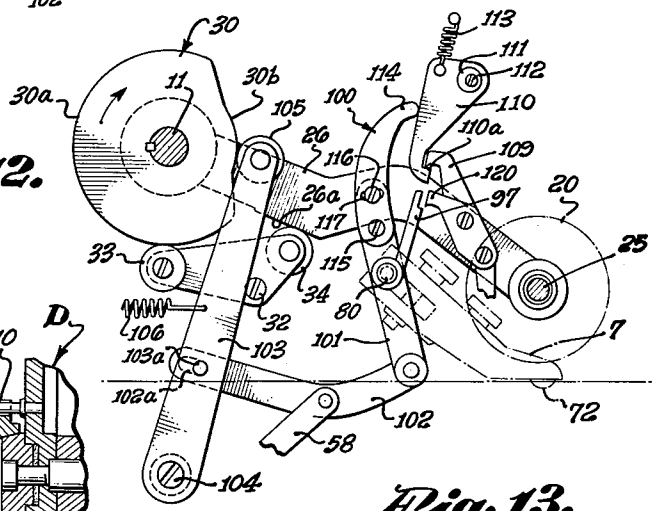


Fig. 12.

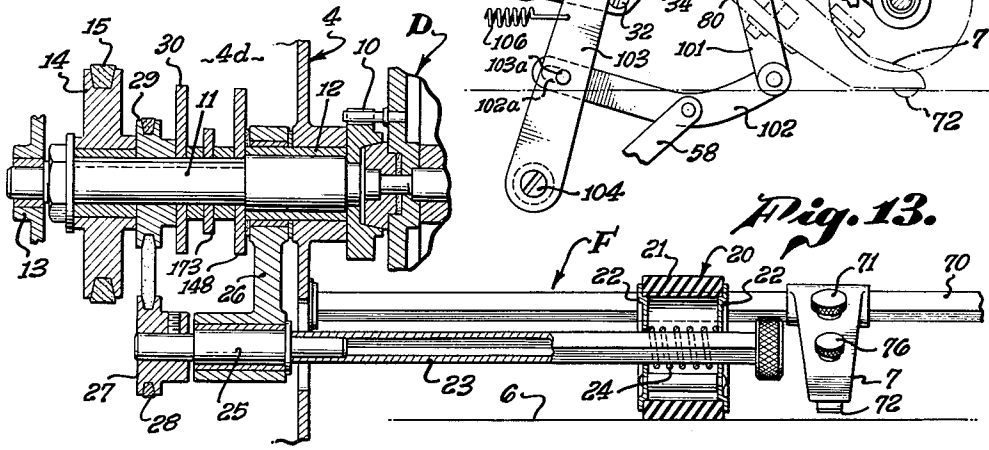


Fig. 13.

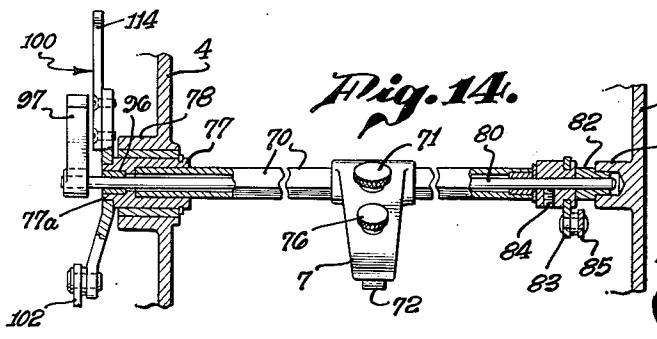


Fig. 14.

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PAPER FEED MECHANISM FOR DUPLICATING MACHINES AND THE LIKE

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Fig. 16.

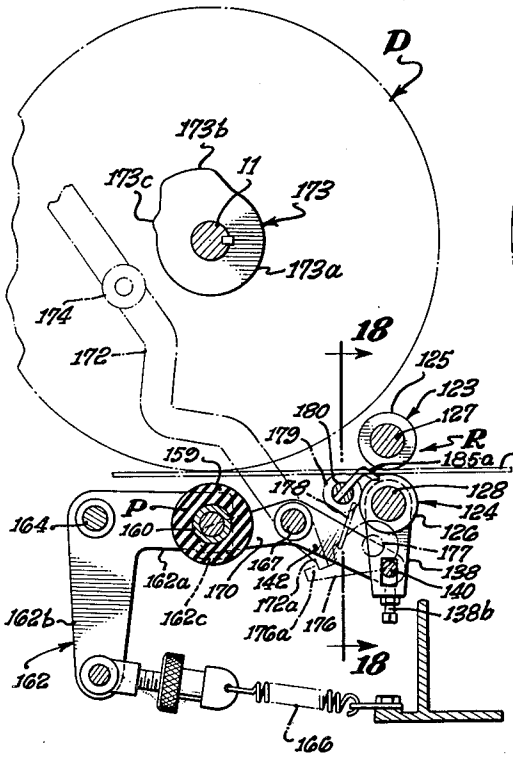


Fig. 17.

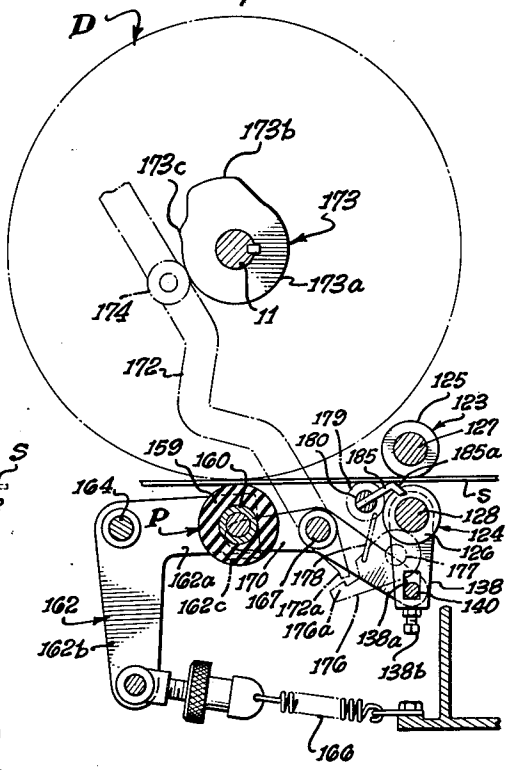


Fig. 18.

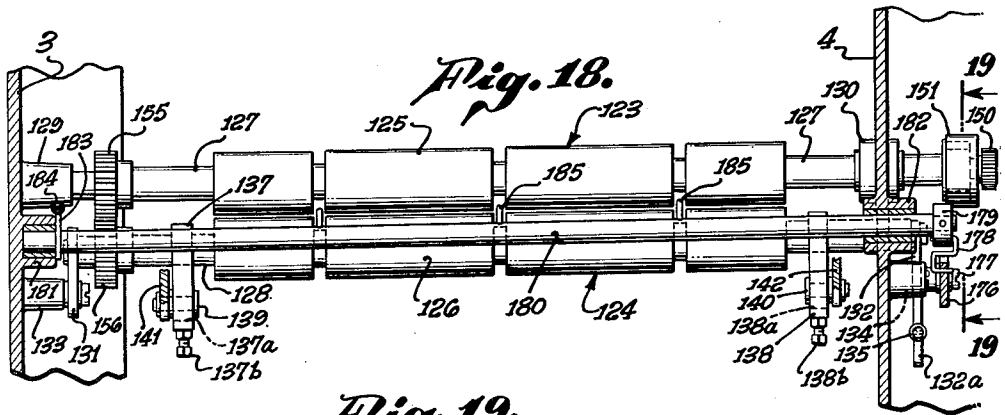
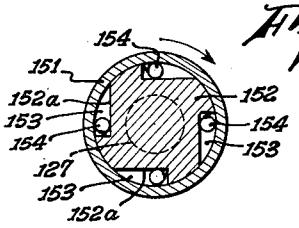


Fig. 19.



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Fig. 20.

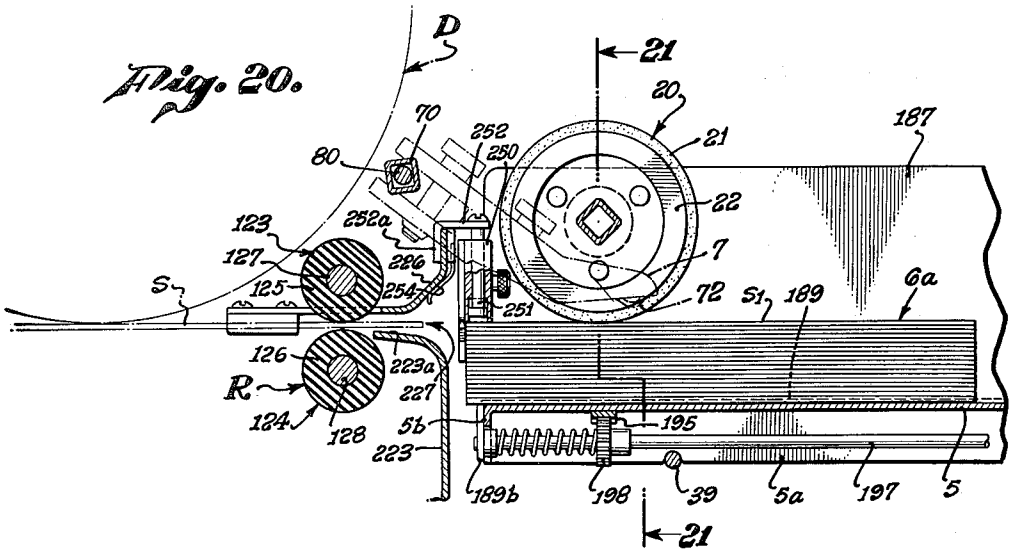


Fig. 21.

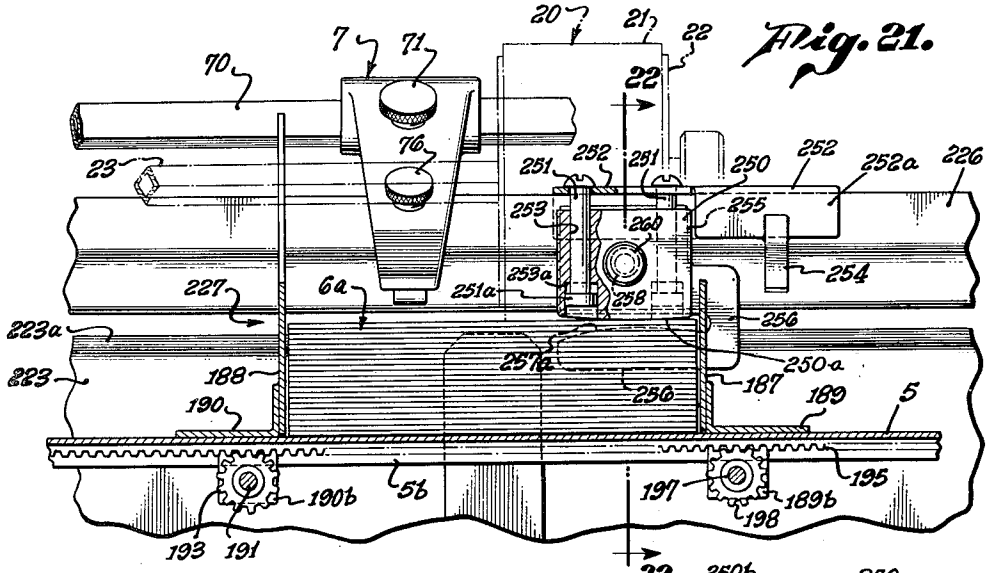


Fig. 22.

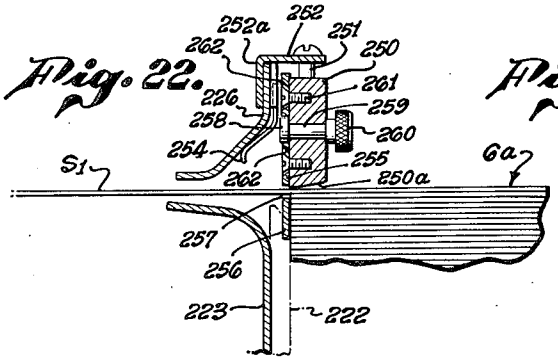
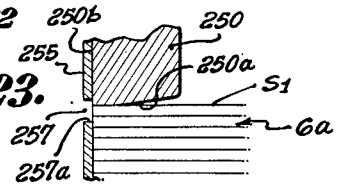


Fig. 23.



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UNITED STATES PATENT OFFICE

2,679,799

PAPER FEED MECHANISM FOR DUPLICATING MACHINES AND THE LIKE

Richard W. Bailey, Pasadena, Calif., assignor to Milo Harding Company, Los Angeles, Calif., a partnership

Application October 5, 1949, Serial No. 119,624

26 Claims. (Cl. 101—118)

1

This invention relates to printing or duplicating machines of the type employing a rotatable printing drum; more particularly, it relates to paper feed mechanism for such machines.

It is an object of this invention to provide improved mechanism of this character.

It is another object of this invention to provide paper feed mechanism wherein the loading of the paper magazine is simplified, the paper feed starting thereafter automatically and without attention on the part of the operator. Furthermore, the feed stops automatically just before the paper in the magazine is exhausted. Thus, no further attention on the part of the operator is necessary after once loading the magazine and starting the machine until it is desired to reload the magazine.

It is another object of this invention to provide improved means for accurately registering the printing on the paper.

Duplicating machines commonly employ an impression roller or platen for urging the paper against the printing drum. It is another object of this invention to provide improved means to prevent such roller or the like contacting the stencil on the drum when no paper is interposed, thus avoiding transfer of ink from the drum to the roller and subsequent soiling thereby of the back of the printed sheets.

It is another object of this invention to provide a paper feed mechanism for duplicating machines and the like, capable of handling heavy paper stock, such for example as postal cards.

It is another object of this invention to provide a paper feed mechanism including means for advancing successive sheets from the top of a stack of such sheets contained in a magazine, having means for preventing the sheets from adhering together, thus avoiding the feeding or advancing of more than one sheet at a time.

It is another object of this invention to provide a paper feed mechanism including a paper magazine, having improved means for maintaining the sheets in said magazine in proper position for feeding to the printing drum.

It is another object of this invention to provide paper feed mechanism having simple control means operated by the pressing or release of a control member.

This invention possesses many other advantages and has other objects which may be made more easily apparent from a consideration of one embodiment of the invention. For this purpose there is shown one form in the drawings accompanying and forming part of the present specification. This form will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

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In the accompanying drawings:

Figure 1 is a top plan view of a duplicating machine incorporating the invention;

Figure 2 is a side elevation thereof, partly broken away to show the paper magazine structure;

Figure 3 is a fragmentary bottom plan view, on an enlarged scale, of the bottom of the magazine, taken substantially as indicated by line 3—3 of Figure 2;

Figure 4 is a detail section, taken substantially as indicated by line 4—4 of Figure 3;

Figure 5 is a fragmentary longitudinal section on an enlarged scale, taken substantially as indicated by line 5—5 of Figure 1;

Figure 6 is a detail section showing the paper feed roll and control arm of Figure 5, but in different operating positions;

Figure 7 is a longitudinal section of the paper feed control arm;

Figure 8 is a fragmentary cross section, taken substantially as indicated by line 8—8 of Figure 5;

Figure 9 is a fragmentary longitudinal section on a further enlarged scale, taken substantially as indicated by line 9—9 of Figure 1, certain parts being omitted to clarify the showing;

Figure 9-*a* is a detail of one of the cams of Figure 9;

Figure 10 is a transverse section, taken substantially as indicated by line 10—10 of Figure 9;

Figures 11 and 12 are views showing different operating positions of the feed roll and control arm actuating mechanism of Figure 9;

Figures 13 and 14 are transverse sections, partly in elevation, taken substantially as indicated by the correspondingly numbered lines of Figure 9;

Figure 15 is a detail section taken substantially as indicated by line 15—15 of Figure 1;

Figures 16 and 17 are detail views showing different operating positions of portions of the paper advancing mechanism of Figure 9;

Figure 18 is a transverse section taken substantially as indicated by line 18—18 of Figure 16;

Figure 19 is a detail section on an enlarged scale, taken substantially as indicated by line 19—19 of Figure 18;

Figure 20 is a fragmentary longitudinal section on an enlarged scale similar to Figure 5 but on a further enlarged scale, showing an attachment adapting the paper feed mechanism for heavy stock;

Figure 21 is an elevation partly in section, on an enlarged scale, of the attachment as seen from the right of Figure 20;

Figure 22 is a transverse section taken substantially as indicated by line 22—22 of Figure 21; and

Figure 23 is an enlarged detail of a fragment of Figure 22.

The paper feed mechanism of the invention is shown as incorporated in a duplicating machine having a continuously rotating drum D with a stencil of known type extending partly about its periphery for passing ink from the interior of the drum to print sheets S passed successively between the drum D and an impression roller or platen P, in accordance with the cutting of the stencil, the remainder of the periphery being blank. The sheets S are fed from a magazine M, including an elevatable platform 5 supporting a stack of the sheets and means for properly positioning the stack thereon with respect to the drum D, by feeding means F which is caused to contact intermittently the top of the stack and initiate successively travel of the topmost sheet toward the printing drum. This initial movement of the sheet brings its advancing edge against the contacting surfaces of a pair of gating rollers R, which are normally stationary and stop the advance. However, means synchronized with the rotation of the printing drum D are provided for causing rotation of the gating rollers R to further advance the sheet to engage the printing drum D and impression roller P at such point in the rotation of the drum D as to properly position the printing with respect to the head of the sheet S. The arrangement is such that the feeding means F releases the sheet just after the gating rollers R begin to advance the sheet, which rollers R in turn are caused to release the sheet just after it has been engaged between the printing drum D and the platen P. The printing drum as it rotates thereafter completes the advance of the sheets, during which they are printed, and delivers the printed sheet to a second magazine N on the other side of the printing drum D from the magazine M.

The compression roller P is resiliently urged toward the drum D for confining the sheet received from the gating rollers R thereagainst, means being provided for cyclically moving the roller P away from the drum D in the interval between the arrival of successive sheets. This means is so arranged that when no sheet is advanced by the gating rollers R, the roller P is prevented from contacting the printing drum during the succeeding printing cycle, thus preventing an impression directly on the roller surface.

It is desirable that the successive sheets be fed to the gating rollers R from a substantially constant height with respect thereto. Accordingly, automatic means E are provided for elevating the magazine platform 5, controlled by a feeler or arm 7 which is caused to contact the top of the paper stack after each operation of the feeding means F. This arm 7 also controls the movement of the feeding means into engagement with the top of the stack. If the top is not high enough, the elevating means E is caused to operate and the feeding means F is prevented from engaging

the top sheet. When the top sheet reaches the proper height, the elevation of the platform 5 ceases, and the feeding means F is caused to deliver the top sheet from the stack. Thereafter, the elevation means E is caused to operate as required in accordance with the removal of the sheets S from the stack 6, until the operation of the mechanism is stopped by the operator, or until the platform reaches a predetermined height just before the stack 6 is exhausted, when the elevating means E is automatically rendered inoperative.

Referring in detail to the drawings, the duplicating machine is shown as comprising a frame 1 providing a horizontal bed plate 2 with the drum D supported at an intermediate point thereon by the aid of longitudinally extending walls 3 and 4 respectively adjacent the front and back edges of the frame 1. The wall 3 has a horizontal inwardly directed flange 3–*a* forming a protective covering for some of the operating mechanism. The back wall 4 is spaced inwardly from the back edge of the frame 1 and has a horizontal flange 4–*a* extending substantially flush with said frame edge, a sheet metal cover 4–*b* removably secured as by screws 4–*c* cooperating with the frame and flange 4–*a* to form a dust proof housing 4–*d* for other parts of said operating mechanism.

The drum D and its manner of mounting, may be of any suitable type, for example such as that disclosed in my copending application filed July 21, 1948, under Serial No. 105,942, and entitled "Rotary Printing Drum for Duplicating Machines." Thus, as shown in Figures 1 and 13, the drum D is mounted on the members 9 and 10 rotatably supported on the walls 3 and 4 respectively. The member 10 normally drives the drum D for which purpose it is fixed on the inner end of a short shaft 11 (see Figure 13) which extends through a bushing 12 fixed in the wall 4, to a bearing 13 suitably supported (by means not shown) within the housing 4–*d*. A pulley 14, fixed on the shaft 11, is connected in driving relation by a belt 15, with a pulley 16 (see Figure 2) driven through an appropriate speed reducer 17 by a small motor 18 mounted within the housing 4–*d*. When necessary, the drum D may be rotated by the aid of the hand crank C and the optionally engageable gearing 8.

The paper feeding means F comprises a cylindrical member or roller 20 having a peripheral band 21 formed of sponge rubber or being otherwise arranged to exert a frictional drag on the sheets to be printed. The band 21 is confined between a pair of end plates 22, having non-circular apertures for slidingly accommodating the shaft 23 and forming a splined connection therewith, for which purpose the shaft 23 and the said openings may be square as shown. The feed roller 20 is retained in adjusted axial position on the shaft 23 by a coiled spring 24 within the roller 20, frictionally engaging the exterior of the shaft 23 and confined between the end plates 22.

The shaft 23 has an enlarged cylindrical end portion 25 rotatably mounting the shaft 23 in an arm or lever 26 mounted on the exterior of the bushing 12 for angular movement thereabout to raise and lower the feed roller 20. A pulley 27 fixed on shaft 23 is connected by a belt 28 to a pulley 29 fixed on the drum shaft 11 so that the feed roller 20 rotates continuously with the drum D.

The arm 26 is operated cyclically to raise and lower the feed roller 20 in accordance with the

rotation of the drum D by the aid of a cam member 30 mounted on the shaft 11 (see Figures 9, 11, 12 and 13), and which it will be noted has high and low portions 30–*a* and 30–*b* respectively, which are circular about the axis of the cam. A lever member 31 pivotally mounted intermediate its ends on a pin 32 fixed in the wall 4 carries a roller or cam follower 33 at one end which engages the cam 30 and a roller 34 at its opposite end for engaging a surface 26–*a* on the bottom of arm 26. The weight of the arm 26, together with that of the feed roller 20 and associated parts urges the arm 26 downwardly to engage the roller 34 and swinging the lever 31 to cause the cam follower 33 to engage the cam 30. Thus, as the cam 30 rotates, the lever 31 is oscillated about its pivot 32, raising and lowering arm 26 together with the feed roller 20, the circular cam surfaces 30–*a* and 30–*b* providing periods of dwell when the roller is at its upper and lower positions respectively. The roller 20 as it moves downwardly is adapted to engage the top of the sheet stack 6 if at the predetermined elevation previously discussed, the rotation of the roller 20 advancing the top sheet S toward the printing drum D. If desired a tension spring 35 may be connected to the arm 26 to increase the force urging the roller 20 against the stack 6.

As previously mentioned and as will be discussed more fully hereinafter, it is desirable that the sheet S be within a predetermined range of elevation with respect to the drum T when fed from the stack 6. Thus, the platform 5 which supports the sheet stack 6 is formed with depending side and end flanges 5–*a* and 5–*b* and is supported on a pair of transverse bars 39 and 40 which engage the side flanges 5–*a* (see Figures 2, 3, 4, 5 and 9). The bars 39 and 40 extend to points beneath the flanges 3–*a* and 4–*a* respectively for which purpose slots 45 are provided in wall 4. The bars 39 and 40 are supported by pairs of cables or tapes 41—42 and 43—44 engaging their opposite ends respectively.

Referring to Figure 9, the element or tape 42 extends upwardly from the bar 39, over a rotatably mounted sheave 46, downwardly and about a sheave 47 to a winding drum 50. Similarly, the element or tape 44 extends upwardly from the bar 40 over a rotatable sheave 48, downwardly to the sheave 47 and thence to the drum 50, being wound on the element 42, the slightly increased rate at which the element 44 winds or unwinds due to this arrangement being of no consequence since the elements are very thin. As shown in Figure 5, the elements 41 and 43 are similarly arranged and wind on a common drum 49.

As shown in Figure 10, the drums 49 and 50 are fixed on a tubular shaft 53 which extends between the walls 3 and 4, being rotatably mounted in bosses 55 and 56 respectively provided therein. The shaft 53 is arranged to be driven by a ratchet wheel 57 operated by a pawl 58, the ratchet wheel 57 being fixed on one end of a shaft 59 which extends through the shaft 53 and is supported for independent axial and rotary movement therein. The ratchet wheel 57 is connected in driving relation with the drums 49 and 50, and shaft 53 by means of a pin 60 projecting from drum 50 and engaging an aperture 61 in the ratchet wheel 57. The shaft 59 extends through the wall 3, having an operating knob 62 secured on its outer end; a compression spring 63 confined between the knob 62 and a suitable abutment in the bearing boss 55 normally maintaining the ratchet wheel 57 in driving relation with the drum 50. When it is desired to disconnect the ratchet wheel 57, axial force is applied to knob 62 to move the shaft 59 and the ratchet wheel 57 sufficiently to the left to free the ratchet wheel from the pin 60. This will allow the platform 5 to return to its lowermost position by gravity, a counterbalance spring 64 serving to check its fall and assist in its elevation. Release of the knob 62 allows return of the ratchet wheel 57 and shaft 59 to their normal positions, appropriate angular movement of the ratchet wheel 57 by means of the knob 62 serving to align the pin 60 and aperture 61 for reengagement. It will be noted that the pawl 58 has an elongated claw 58–*a* for maintaining engagement with the ratchet wheel 57 and supporting the pawl 58 in either axially adjusted position of the ratchet wheel. A pawl 66 which prevents reverse rotation of the ratchet wheel 57 is similarly arranged to maintain contact with the ratchet wheel at all times. To limit rotation of the ratchet wheel 57 so that upward movement of the platform 5 automatically at an appropriate point ceases, a blank space 57–*a* without teeth is provided on the periphery of the ratchet wheel 57 (see Figure 9). When this space 57–*a* reaches the pawl 58, movement of the pawl is no longer effective to advance the ratchet wheel 57, the parts being so proportioned that the movement of the platform 5 ceases when the platform 5 is a short distance below the elevation from which the sheets S are fed, so that a few sheets of the stack 6 remain.

The feeler or control arm 7 for controlling the elevation of the platform 5 (see Figures 5, 7 and 14) is mounted on a square tubular rock shaft 70 for angular movement therewith, being clamped in adjusted axial position thereon by means of a thumb screw 71. Arm 7 has an adjustable contact surface 72 for engaging the top of the stack 6 provided by one end of a member 73 pivotally mounted by the aid of pin 74 near the outer end of the arm 7. A light compression spring 75 engages the other end of the arm 73 urging surface 72 toward the arm 7, such movement being controlled by a thumb screw 76. In this way, the angular relationship between the rock shaft 70 and the contact surface 72 may be altered.

As shown in Figure 14, the shaft 70 extends between the walls 3 and 4, one end being supported by a cylindrical sleeve 77 fixed on the shaft 70 and rotatably mounted in a bushed hub 78 in the wall 4–*a*. The other end is supported on a control shaft 80 extending axially through the tubular rock shaft 70 and supported in a hub 81 on the wall 3 by a spacer sleeve 82. Between the end of the shaft 70 and the sleeve 82, the hub of a short lever 83 is secured in angularly adjusted position on the shaft 80 by a set screw 84. A link 85 is connected adjacent one end to the lever 83 and to a tension spring 86 which urges the lever 83 and the shaft 80 to rotate in a counterclockwise direction (see Figure 5). The other end of the link 85 has a slot 85–*a* engaging a pin 87 carried by one arm 88–*a* of a bell crank 88 pivotally mounted in the wall structure 3. A tension spring 89 is connected to the bell crank arm 88–*a* in opposition to spring 86 and of such strength as to prevent movement of the link 85 by spring 86.

The other arm 88–*b* of the bell crank 88 is connected to a vertically extending link 90 which projects above the wall structure 3 and carries

an operating button 91 at its upper end. A stop pin 92 serves by engagement with the wall flange 3–*a* to limit upward movement of the link 90, thereby limiting movement of the bell crank 88 by spring 89 and determining the angular position of the shaft 80.

A tooth 90–*a* provided on the link 90, is adapted to engage beneath a fixed stop or lug 93 upon appropriate downward movement of the link 90, the link thereafter being swung to the left about its pivotal connection with the bell crank arm 88–*b* and the downward force released to cause the tooth 90–*a* to engage the stop 93. This locks the link 90 and the operating button 91 in their lower positions.

This downward movement of the link 90 swings the bell crank arm 88–*a* to the right, freeing the link 85, by virtue of the slot 85–*a*, for movement to the right in response to the force of the spring 86 which movement turns the lever 83 and shaft 80 counterclockwise.

The swinging or latching movement of the lever 90 toward the lug 93 is opposed by a tension spring 95 connected to an extension 90–*b* of the link 90 below its point of attachment to the bell crank arm 88–*b*. Thus, when the link 90 is locked in its lower position upon exertion of momentary downward pressure to free the tooth 90–*a* from the lug 93, the spring 95 will swing the link 90 to the right so that the tooth 90–*a* clears the lug 93, and allowing the spring 89 acting through the bell crank 88, to return the link 90 to its upper position. Shaft 80 at the end remote from the lever 83 is supported by a bushing 96 in the sleeve 77 for rotation independently thereof, the shaft 80 projecting from the sleeve 77 and having an upwardly directed holding member 97 secured thereon. (See also Figures 9, 11 and 12.)

As clearly shown in Figure 14, an operating arm 100 is suitably secured on a reduced extension 77–*a* of the sleeve 77 for angular movement therewith. This arm 100 has a downwardly directed portion 101 pivotally connected to one end of a link 102 which is connected for operation by an arm 103 by means of a slot 102–*a* at its other end engaging a pin 103–*a* at an intermediate point on the arm 103. This arm 103 is pivotally supported within the housing 4–*d* as by a pin 104 secured to wall 4. The upper end of the arm 103 rotatably supports a roller or cam follower 105 which is urged toward the cam 30 by a tension spring 106 connected to the arm 103. Thus, as the cam 30 rotates, the arm 7 is raised and lowered cyclically with the rotation of the drum D between positions respectively above and below the predetermined elevation of the top of the stack 6, unless downward movement of the arm 7 is checked by contact of the surface 72 thereon with the stack 6. When the downward movement of arm 7 is thus checked, the slot 102–*a* allows the arm 103 to continue movement under the influence of spring 106 so that roller 105 remains in contact with the cam 30, insuring more quiet and smoother operation of the mechanism. As previously discussed, the cam 30 also operates to raise and lower the feed roller 20 by means including the cam follower 33. As clearly shown in Figures 9, 11 and 12, the cam follower 105 which operates to raise and lower the arm 7 is angularly displaced about the cam 30 from the cam follower 33 so that arm 7 is raised out of contact with the stack before the feed roller 20 engages the stack 6 to advance the top sheet S.

The pawl 58 which operates the ratchet 57 for elevating the platform 5 is pivotally secured to the link 102 and depends therefrom into releasable engagement with the ratchet wheel 57 due to the weight of the pawl. As the link 102 moves back and forth in accordance with the movement of the arm 103 operating the control arm 7, the pawl 58 advances the ratchet wheel 57 and the winding drums 49 and 50 in a clockwise direction (see Figure 9), elevating the platform 5 and the stack 6 of sheets S thereon. When the top of the stack 6 reaches the proper or predetermined elevation, the travel of the arm 7 together with the connected parts is so restricted by engagement of the arm surface 72 with said top that the pawl 58 does not have sufficient travel to engage successive teeth on the ratchet wheel 57. This may be termed conveniently the normal limit of movement of the arm 7. Thus, rotation of the ratchet wheel 57 and drums 49 and 50 ceases and the elevation of the platform 5 stops, reverse rotation and lowering of the platform 5 being prevented by the pawl 66. However, as the sheets S are fed from the top of the stack 6 by the feeding means F, the elevation of the top decreases and the travel of the arm 7 and connected parts increases beyond said normal limit, the increased travel of the pawl 58 soon becoming sufficient to enable the pawl to engage the next tooth on the ratchet wheel 57, imparting rotation to the ratchet wheel and raising the platform 5. By appropriate proportioning of the parts, the top of the stack 6 may be maintained at the proper elevation within close limits.

To prevent feeding of sheets S by the means F when the sheets are not at the proper elevation, means responsive to movement of the arm 7 past the previously mentioned normal limit are provided for preventing the feed roller 20 from contacting the stack 6. Thus, a hook member 109 is provided on the arm 26 which supports the feed roller 20, and is adapted for engagement by a latch member 110 pivotally mounted on an eccentric bushing 111 adjustably secured to the wall 4 by a screw 112. Rotation of the bushing 111 serves to adjust the height of the latch 110 with respect to the hook 109. A tension spring 113 maintains the latch 110 normally out of the path of travel of the hook 109. However, the lever 109, operating the rock shaft 70 and arm 7 etc., has an upward extension 114 adapted to engage the latch member 110 upon movement of the control arm 7 past its normal limit of movement, to swing the latch member 110 to bring the latch surface 110–*a* thereof into a position immediately beneath the hook 109 when arm 26 is at the upper limit of its movement. Thus, as the arm 26 starts down, hook 109 engages the surface 110–*a* which prevents further downward movement and maintains the feed roller 20 out of contact with the paper stack 6 during the succeeding cycle of operation. Thereafter, at every cycle the cam 30 lifts the arm 26 enough to release the latch member 110 for movement out of the path of hook 109 by spring 113, but if the top of the stack 6 is still too low, arm 114 returns the member 110 to latching position, preventing movement of the feed roller 20 to engage the stack. However, if the top of the stack 6 is at the proper elevation, the movement of arm 7 and connected parts is so limited as to prevent the lever extension 114 moving the member 110 to latching position. This extension 114 is angularly adjustable with respect to the rock shaft 70 and the lever 109, being pivotally mounted at 115 on the lever 109 and retained in adjusted

position by a screw 116 on the lever 100 engaging a slot 117 in the extension 114.

A second hook member 120 is provided on the arm 26, engageable by the holding member 97 on the control shaft 80 when operated to holding position, to prevent downward movement of the arm 26 causing the feed roller 20 to engage the paper stack 6. When the control button 91 is in its upper position, the member 97 is in said holding position, with the arm 26 just below the upper limit of its travel. Movement of the control button 91 to its lower position, as previously discussed, by virtue of slot 85–*a*, releases link 85 and lever 83 for movement to the right (Figure 5) to cause counterclockwise rotation of the control shaft 80 in response to spring 86 upon release of the member 97 by upward movement of the arm 26. The slot 85–*a* prevents positive movement of the member 97 by downward movement of the control button 91 and possible damage to the parts which would be apt to occur if the member 97 were moved positively before release by the upward movement of the arm 26. The gating rollers R for delivering the sheets S in proper registry with the printing drum D are indicated by the numerals 123 and 124 (see Figures 5, 16, 17 and 18). Each of these rollers may comprise a rubber shell 125 and 126 to insure against slippage of a sheet S when gripped between the rolls, formed on shafts 127 and 128 respectively. The upper roller 123 is supported for rotation about a fixed axis by the aid of bosses 129 and 130 provided in the wall structures 3 and 4 respectively. The lower roller 124 is supported for movement toward and away from the roller 123 by arms 131 and 132 pivotally mounted in bosses 133 and 134 provided on the walls 3 and 4 (see Figure 18). One of the arms, such as arm 132, has an angularly offset extension 132–*a* to which a tension spring 135 is connected for urging the lower roller 124 upwardly and against roller 123 (see Figure 9). A pair of members 137 and 138 depend from the opposite end portions of the shaft 128 of the lower roller, having slots 137–*a* and 138–*a* respectively engaged by pins 139 and 140 on the oscillatable arm members 141 and 142 for urging the lower roller 124 away from the upper roll 123 as will be more fully discussed hereinafter. Adjusting screws 137–*b* and 138–*b* are provided respectively in the members 137 and 138 to alter the timing of the release of the sheet by the rollers 123 and 124. The upper roller 123 is rotated through a definite angle and cyclically with the drum D by the aid of a gear sector 144 formed on an arm 145 pivotally mounted at 146 in the wall structure 4. This arm 145 has a roller 147 rotatably mounted thereon for engaging a cam 148 fixed on shaft 11, a tension spring 149 connected to the arm serving to urge the roller 147 toward the cam 148.

The gear sector 144 meshes with a pinion 150 (see Figures 9 and 18) rotatably mounted on the upper roller shaft 127 by the aid of a cup shaped member or shell 151 which forms the driving element of a conventional one-way clutch (see also Figure 19). The other element of the clutch comprises a cylindrical member 152 telescoped within the member 151 and fixed to the shaft 127. A plurality of axially extending recesses 152–*a* are formed in the exterior of the member 152, which cooperate with the inner surface of the shell 151 to form pockets 153 having converging surfaces between which the rolling elements 154 are confined.

Clockwise rotation of the shell 151, in accordance with rotation of the pinion 150 caused by operation of the sector 144 and arm 145 to the right by the cam 148, will urge the rolling elements 154 into wedging relation between the shell 151 and member 152 in a well understood manner, so that the roller 123 is rotated in sheet advancing direction. Reverse rotation of the shell 151 caused by return movement of the sector and arm 144 and 145 frees the rolling elements 154 so that the member 152 and roller 123 do not rotate in the oposite direction. The lower roller 124 is driven in sheet advancing direction simultaneously with the upper roller 123 by a pair of gears 155 and 156 respectively fixed on the shafts 127 and 128 (see Figures 5 and 18).

Since the gating rolls 123 and 124 determine the position of the printed matter with respect to the head of the sheet S, it is important that their rotation advancing the sheet to the printing drum D be accurately timed with respect to the rotation of the drum D. For this purpose the cam 148 (see Figure 9–*a*) has a depression 148–*a* which allows the arm 145 and parts operated thereby to return past the normal position or "dwell" at the end of the return stroke. Thus, when advanced to the normal "dwell" position, all back lash and lost motion between the parts is taken up, so that when the "use" or "feed" 148–*b* becomes effective, rotation of the rollers 123 and 124 and advance of the sheet will start immediately and accurately in the required relation with the drum D.

The impression roller or platen P comprises a resilient body 159 of rubber or the like, fixed on a shaft 160 which extends beyond the opposite ends of the body 159 and rotatably engages the arms 161–*a* and 162–*a* respectively of the bell cranks 161 and 162 (see Figures 5, 16 and 17). The bell cranks 161 and 162 are pivoted at 163 and 164 in the walls 3 and 4 respectively for movement to cause the roller P to move toward and away from the drum D, a pair of tension springs 165 and 166 adjustably connected respectively to the other bell crank arms 161–*b* and 162–*b*, urging the roller P toward the drum D.

The previously mentioned arm members 141 and 142 for lowering the lower gating roll 124 are secured on a rotatably mounted shaft 167 extending transversely between the walls 3 and 4. A pair of arm members 169 and 170, oppositely directed with respect to members 141 and 142, are also secured to the shaft 167, the outer ends thereof upon downward movement being adapted to engage respectively lateral projections 161–*c* and 162–*c* on the bell crank arms 161–*a* and 162–*a* urging the bell cranks clockwise so that the roller P is spaced from the drum D.

The arrangement is such that movement of the shaft 167 in one direction from an intermediate position causes separation of the gating rollers 123 and 124 and releases the impression roller P to urge the sheet to be printed against the printing drum D, movement in the opposite direction from said position allowing the gating rollers 123 and 124 to engage and causing lowering of the roller P to a position clear of the drum D.

An operating arm 172, fixed on the shaft 167 (see also Figure 9) and actuated by a cam member 173 on the shaft 11, serves to operate the shaft 167 cyclically in accordance with the rotation of the drum D and operation of the feed roller 20. Arm 172 carries a roller 174 for engaging the cam 173 and is urged in a direction to

cause the roller 174 to approach the cam 173 by a tension spring 175.

The cam member 173 has a circular portion 173–*a* and a lobe 173–*b*. When the cam follower or roller 174 is in engagement with the circular portion 173–*a*, the parts are so positioned that the gating rollers 123 and 124 are spaced apart, and the impression roller P is free to engage the drum D (see Figure 17). When rotation of the cam 173 in a clockwise direction brings lobe 173–*b* into engagement with the roller 174 (see Figure 9), the parts are so positioned that the gating rollers 123 and 124 are in contact and the roller P is restrained from engaging the drum D (see Figure 5).

Further rotation of the cam member 173 causes the lobe 173–*b* to move from engagement with the cam follower 174, allowing arm 172 to move clockwise. This allows the impression roller P to engage the drum D, the parts being so proportioned and arranged that the roller P engages the blank portion provided on the surface of the drum D, as shown in the previously identified copending application. This occurs just before the edge of the sheet S advanced by the pressure rollers R reaches the roller or platen P, so that when the sheet S enters between the roller P and the drum D, the roller P will be revolving at the proper speed.

The impression roller P and the gating rolls R are held in this position by engagement of the cam follower 174 with the advancing surface of a rise or lobe 173–*c* on the cam member 173, which surface may be substantially concentric with the axis of the cam member. Thereafter rotation of the cam 173 causes the gating rollers 123 and 124 to separate just after the sheet is engaged between the platen P and the drum D.

To prevent release of the impression roller P when no paper has been advanced from the magazine M a latch member 176 is provided, having a tooth 176–*a* for engaging an extension 172–*a* of the lever 172 and releasably maintaining the lever 172 and associated parts against movement to release the roller P (see Figures 5, 9, 16, 17 and 18). The latch member 176 is pivotally mounted at 177 for movement between a position engaging the extension 172–*a* and a position releasing said extension, and is connected by a link 178 with a circular member 179 secured on the end of a shaft 180 extending parallel with and just below the contacting portions of the gating rollers 123 and 124. This shaft 180 is rotatably supported by a boss 181 on the wall 3 and a boss 182 through which it extends, on the wall 4. A short arm 183 is fixed on the shaft 180 adjacent the bearing boss 181, a tension spring 184 connected thereto resiliently urging the shaft 180 in a counterclockwise direction (see Figures 5 and 18) and maintaining the latch member 176 in position for engaging the extension 172–*a*.

A plurality of axially spaced radially extending fingers 185 are provided on the shaft 180 and normally extend across the line of contact between the rollers 123 and 124, providing an inclined surface 185–*a* for engagement by a sheet S advanced by the rollers (see Figure 16). As the sheet S advances, the fingers 185 are depressed, rotating the shaft 180 clockwise and causing the latch 176 to release the lever 172 which in turn releases the impression roller P, as previously discussed (see Figure 17).

The platform 5 which supports the stack 6 of the sheets S has a pair of side members 187, 188 thereon, providing spaced parallel surfaces for laterally positioning the stack 6 and guiding the sheets S as they are fed to the drum D (see Figures 1, 2 and 5). These members 187 and 188 are slidably mounted on the platform 5 by the aid of horizontal extensions or feet 189 and 190. As clearly shown in Figures 1, 3, 4 and 5, the foot extension 190 has the end portions bent down at the opposite ends of the platform 5 to form depending lugs 190–*a* and 190–*b* rotatably supporting a shaft 191 on which are mounted gears 192 and 193 engaging respectively racks 194 and 195 fixed on the under side of the platform 5. A light compression spring 191–*a* appropriately confined on the shaft 191 against the gear 193 prevents axial looseness of the shaft. The opposite side member 187 is similarly arranged, the foot extention 189 thereof providing depending lugs 189–*a* and 189–*b* (Figure 1) rotatably supporting shaft 197 (see also Figures 20 and 21), carrying gears, one of which is shown at 198, respectively engaging the racks 194 and 195 which extend across the platform 5. In this way, the side members 187 and 188 are maintained parallel with each other in all adjusted positions.

The members 187 and 188 are adapted to be secured in adjusted spaced relation on the platform 5 by the aid of a clamping plate 200 extending across the under side thereof (see Figures 1, 3, 5 and 15), and guided for transverse movement by a pair of rectangular blocks 201 and 202 slightly thicker than plate 5, which slidingly engage the slots 203 and 204 in the platform 5. The plate 200 also has a pair of through slots 205 and 206 and is supported by the aid of headed rectangular pins 207 and 208 which extend upwardly through the slots 205 and 206 respectively, through the blocks 201 and 202, and through clearance openings 209 and 210 in the foot extensions 189 and 190 of the members 187 and 188 for pivotal attachment of their upper ends between the arms of forked locking levers 211 and 212 respectively. The lower end of lever 212 is formed as a cam surface 212–*a*, a convex spring member 213 through which the pin 208 extends being confined between the cam surface 212–*a* and the foot 190. The other lever 211 is similarly arranged.

The arrangement is such that when the lever 212 is inclined to the right as shown in Figure 15, a high portion of the cam surface 212–*a* engages the resilient member 213, compressing the member 213 and urging the pin 208 upwardly, so that the foot 190 is clamped against the plate 200 by the aid of block 202. The member 213 has an extension 213–*a*, acting as a stop and cooperating to maintain the lever 212 in clamping position. Thus, relative movement between the member 188 and the plate 200 is prevented, the member 188 and the plate 200, however, being readily movable on the platform 5, the gears 192, 193 in connection with the racks 194, 195 serving to maintain the member 188 in parallelism for all adjusted positions.

Movement of the lever 212 to the left to bring the low portions of the cam surface 212–*a* against the member 213, lowers the pin 204, releasing the member 188 from clamping engagement with the plate 200 so that the member 188 may be adjusted on the platform 5 independently of the plate 200. Corresponding operation of the lever 211 serves similarly to clamp the member 187 for movement with the plate 200 or independently thereof.

To facilitate proper lateral positioning of the sheets S with respect to the drum D, means are provided for adjusting the plate 200, transversely

of the platform 5. Thus, after the members 187 and 188 have been secured in adjusted position to the plate 200, they may be shifted without altering their spacing.

For this purpose, the plate 200 has a short rack 216 secured thereon intermediate its ends and engaged by a gear 217 mounted on a shaft 218 rotatably supported beneath the platform 5 by suitable bearing means 219 and 220 thereon. The shaft 218 extends rearwardly of the platform 5 and has an operating knob 221 secured thereon exteriorly of the platform. Rotation of the shaft 218 will shaft the member 200 together with the members 187 and 188 if clamped thereon, in an obvious manner.

To locate the forward edge of the stack 6 in the magazine M a stacking post 222 is provided a short distance ahead of the platform 5 and is engageable by the stack 6. The post 222 terminates just below the top of the stack when at the predetermined elevation, so as not to interfere with the feeding of the top sheet S (see Figures 1 and 5). Further, the upper end of the post 222 is beveled, as at 222–*a*.

The stacking post 222 is mounted for horizontal adjustment on a vertically disposed transversely extending plate 223 by the aid of a bolt 224. The plate 233 is suitably secured to a cross member 228 of the frame 1 and has its upper end portion bent through a large radius to form an upwardly and forwardly inclined surface 223–*a* cooperating with a transverse member 226 supported thereabove and having a downwardly and forwardly inclined surface, to form a converging throat 227 for accurately directing the sheets from the top of the stack 6 between the gating rollers 123 and 124.

To reduce the possibility of the stacked sheets S sticking together in the magazine M so that more than one sheet is fed at a time, means are provided adjacent the rear of the stack 6 for curving or buckling the sheets in a non-uniform manner to partly separate them. For this purpose, a supporting element 230 is provided on each of the side members 187 and 188 having a foot 231 at its lower end for engaging the outer edge portion of the bottom of the stack 6 and supporting it above the platform 5 (see Figures 1, 5 and 8). Each of the elements 230 has a vertically extending portion 232 with the foot 231 at its lower end and projections 233 engageable with the top edge of the side member 187 or 188 near its upper end for suspending the element 230 therefrom. A clip 234 operated by a thumb screw 235 serves to clamp the element 230 in place.

For maintaining the upper sheets of the stack 6 at a different curvature than the bottom, a wedge shaped element 237 is resiliently urged between the top portion of the stack 6 and each of the side members 187 and 188 (see Figure 8). This element 237 is carried by the outer end of an arm 238 pivotally mounted on a bracket 239 supported on the upper edge of each of the members 187 and 188, and secured in adjusted position therealong by means of a clip and thumb screw 240 and 241, as before. A weight 242 urges the arm 238 downwardly so that the arm exerts substantially a constant lateral pressure on the upper portion of the stack 6 as the sheets are fed therefrom. The means including the wedge shaped elements 237 and the supporting elements 230 may be adjusted longitudinally of the stack 6 as desired.

For handling heavy paper stock, such as postal cards for example, supplemental means controlling the movement of the sheets from the stack may be desirable. As shown in Figures 20–23, this means comprises a rectangular block 250 having a convex, forwardly and downwardly inclined bottom edge 250–*a* adapted to rest on the top of the stack 6–*a*, when at substantially the proper elevation. The block 250 is guided for limited vertical movement by a pair of pins 251 depending from a bracket 252 and extending downwardly through clearance holes 253 in the block 250, the lower ends of the holes being counterbored to accommodate the heads 251–*a* of the pins 251 and providing shoulders 253–*a* which by engaging the heads 251 limit downward movement of the block 250.

The bracket 252 comprises a narrow inverted U-shaped portion 252–*a* adapted to engage the vertical portion of the cross member 226 and be releasably retained thereon by the aid of a spring clip 254 secured to one of the legs of the portion 252–*a* and engageable beneath the inclined portion of the cross member. The parts are so proportioned and arranged that when mounted, the forward face 250–*b* of the block 250 is substantially aligned with the stacking post 222 and the forward edge of the stack 6–*a*.

A plate 255 having a hook like extension 256 providing a slot 257 is supported on the front face of the block 250 for vertical adjustment with respect to the block 250. As clearly shown in Figure 23, the width of the slot 257 is substantially greater than the thickness of the sheets S–1 to be fed, the arrangement being such that by suitable adjustment the lower surface 257–*a* of the slot 257 cooperates with the bottom edge 250–*a* of the block 250 to form a restricted opening of such width as to pass only a single sheet. As shown in Figure 21, the surface 257–*a* is upwardly convex and, as previously mentioned, the surface 250–*a* is downwardly convex as well as inclined. Thus, only a limited area of the sheet is contacted, and the frictional drag thereon is reduced.

For adjusting the plate 255, an eccentric 258 engaging a suitable opening in the plate 255 is rotatably mounted on the block 250 by means of a shaft 259 extending through the block and having an operating knob 260 on its outer end. A pair of screws 261 threaded into the block 250 and engaging suitable slotted openings 262 in the plate 255, serve to guide the plate 255 for vertical movement, and when tightened to secure the plate 255 in adjusted position.

The operation of the mechanism may now be reviewed. The platform 5 is first lowered to its lowermost position by manipulating the knob 62 to disengage the winding drums 49 and 50 from driving connection with the ratchet wheel 57. The knob 62 is then manipulated to reconnect the winding drums 49 and 50 in driving relation with the ratchet wheel 57, and the stack 6 of the sheets S to be printed is placed in the magazine M on the platform 5 between the side members 187 and 188 and against the stacking post 222. To facilitate this loading operation, the arms 238 carrying the wedge elements 237 may be swung upwardly about their mountings 239 to a position in which the elements 237 clear the stack 6. These wedge elements 237 together with arms 238 etc., and the supports 230 are not needed with heavy stock, post cards, and the like, and hence may be removed when using the supplemental heavy stock handling means.

The motor 18 is then energized, causing the

shaft 11 to rotate together with the cam members 30, 148 and 173 thereon and the drum D. The rotation of the cam 30 operates the control arm mechanism to cause the arm 7 to oscillate between its upper and lower positions, operating the ratchet wheel 57 to elevate the platform 5 with the stack 6 thereon. When the top of the stack 6 reaches the proper, predetermined elevation for feeding the sheet S therefrom to the printing drum D, downward movement of the arm 7 is reduced and the mechanism is rendered ineffective to operate the ratchet wheel 57 further.

Rotation of the shaft 11 also causes the feed roller 20 to rotate, but the roller 20 may be maintained above the stack 6 and out of contact therewith optionally by having the control button 91 in its upper position so that the member 97 is positioned to engage hook 120 and prevent downward movement of the roller 20. Depression of the button 91 to its lower position moves the member 97 to release the hook 120, downward movement of arm 26 and roller 20 however being prevented by the latch member 110 operated by the control arm mechanism unless or until the top of the stack 6 is at the proper elevation. With the top of the stack at such elevation, the latch member 110 is caused to release the arm 26, roller 20 etc., which thereafter intermittently engages the top of the stack 6, successively advancing sheets S therefrom toward the drum D. This arrangement has important advantages in that it enables the operator to load the magazine M, set the machine in operation, latch the button 91 in its lower or feed position, and proceed with other work, since the paper feed mechanism starts automatically at the proper time.

The sheet S is advanced by the roller 20 so as to be urged between the gating rolls 123 and 124, but since these are stationary at this moment further advance of the sheet is prevented. However, when the printing drum D reaches the proper point in its rotation, the sector arm 145 imparts sufficient rotary movement to the rollers 123 to advance the sheet 5 to printing relation between the drum D and the impression roller P, which at this time is rotating at the proper speed. After the sheet S has advanced a short distance between the drum D and the roller P, the gating rollers 123, 124 are urged apart to release the sheet which is thereafter delivered by rotation of the drum D to the magazine N. The operation of the gating rolls 123, 124 to advance the sheet is accurately correlated to the angular position of the printing drum D, and hence insures proper registry of the printed matter on the sheet S. If no sheet is advanced between the rollers 123 and 124, the latch member 176 is operated to prevent movement of the roller P toward the drum D.

As shown in Figures 1 and 2, the magazine N which receives the printed sheets may comprise a suitable supporting surface 270 formed on the frame f with upstanding side and end members 271 and 272 for restraining the sheets therein as delivered by the printing drum D. An interleaving mechanism generally indicated by the letter I of any suitable type, such for example as that disclosed in my copending application filed August 25, 1947, under Serial Number 770,410, and entitled "Interleaving Machine," may be provided for the magazine N.

I claim:

1. In paper feed mechanism for a duplicating machine or the like having a rotatable printing drum: an impression roller rotatably mounted for movement toward and away from said drum and resiliently urged toward said drum for confining a sheet to be printed thereagainst; means forming a magazine for supporting a stack of sheets to be printed in predetermined spaced relation with said drum; feeding means for successively advancing sheets from said stack toward said drum; means interposed between said stack and said drum for restricting advance of the sheets by said feeding means; means including a cam and a cam follower operable responsive to arrival of said drum at a predetermined angular position about its axis for causing said interposed means to advance said sheets to printing relation between said drum and said roller and to thereafter cause said roller to confine said sheet against said drum; said last named means including a lost motion connection for causing said interposed means to release said sheet after arrival in printing relation.

2. In paper feed mechanism for a duplicating machine or the like having a rotatable printing drum with an impression forming portion extending partly about its periphery: an impression roller rotatably mounted for movement toward and away from said drum and resiliently urged toward said drum for confining a sheet to be printed thereagainst; means forming a magazine for supporting a stack of sheets to be printed in predetermined spaced relation with said drum; feeding means for successively advancing sheets from said stack toward said drum; means interposed between said feeding means and said drum for receiving the sheets advanced by said means and advancing them independently thereof to printing relation between said drum and said impression roller; means retaining said roller spaced from said drum and responsive to arrival of said drum with said portion at a predetermined angular position about the drum axis for releasing said roller to engage the drum; means including a latch member preventing operation of said retaining means to release the roller; and means responsive to the advance of a sheet by said interposed means for causing said latch member to release said roller retaining means.

3. In paper feed mechanism for a duplicating machine or the like having a rotatable printing drum; an impression roller rotatably mounted for movement toward and away from said drum and resiliently urged toward said drum for confining a sheet to be printed thereagainst; means forming a magazine for supporting a stack of sheets to be printed in predetermined spaced relation with said drum; feeding means for successively advancing sheets from said stack toward said drum; means including a pair of normally stationary gating rollers interposed between said feeding means and said drum for receiving the sheets advanced by said feeding means; means responsive to a predetermined angular movement of said drum for operating said gating rollers to advance said sheets independently of said feed means to printing relation between said drum and said impression roller; means including a pivoted latch member normally maintaining said roller spaced from said drum; and an angularly movable element connected to move with said latch member and projecting into the path of advance of said sheets from said gating rollers for operation by an advancing sheet to cause said latch to release said roller.

4. In paper feed mechanism for a duplicating

machine or the like having a rotatable printing drum; an impression roller rotatably mounted for movement toward and away from said drum and adapted to resiliently urge a sheet to be printed against said drum; means forming a magazine for supporting a stack of sheets to be printed in predetermined spaced relation with said drum; feeding means for successively advancing sheets from said stack toward said drum; means interposed between said feeding means and said drum for engaging the sheets advanced by said feeding means and advancing them independently thereof to printing relation between said drum and said impression roller; and means operating in accordance with the rotation of said drum for causing said roller to confine the sheet against said drum and thereafter operating said interposed means to release said sheet.

5. In paper feed mechanism for a duplicating machine or the like having a rotatable printing drum: an impression roller rotatably mounted for movement toward and away from said drum and adapted to resiliently urge a sheet to be printed against said drum; means forming a magazine for supporting a stack of sheets to be printed in predetermined spaced relation with said drum; feeding means including a rotating member for successively advancing sheets from said stack toward said drum; means interposed between said feeding means and said drum for engaging the sheets advanced by said feeding means and advancing them independently thereof to printing relation between said drum and said impression roller; and means including a cam rotatable with said drum for causing said roller to confine the sheet against said drum and thereafter operating said interposed means to release said sheet.

6. In paper feed mechanism for a duplicating machine or the like having a rotatable printing drum with an impression forming portion extending partly about its periphery; an impression roller rotatably mounted for movement toward and away from said drum and resiliently urged toward said drum for confining a sheet to be printed thereagainst; means forming a magazine for supporting a stack of sheets to be printed in predetermined spaced relation with said drum; feeding means for successively advancing sheets therefrom to printing relation between said drum and said impression roller; means interposed between said feeding means and said drum for gripping the sheets advanced by said means and advancing them independently thereof to printing relation between said drum and said impression roller; and means retaining said roller spaced from said drum; means including a cam rotatable with said drum operable responsive to arrival of said drum with said portion at a predetermined angular position about the drum axis for actuating said retaining means to release said roller for movement toward said drum; said means including a lost motion connection for causing said interposed means to release said sheet after arrival in printing relation.

7. In paper feed mechanism for a duplicating machine or the like having a rotatable printing drum with an impression forming portion extending partly about its periphery: an impression roller rotatably mounted for movement toward and away from said drum and resiliently urged toward said drum for confining a sheet to be printed thereagainst; means forming a magazine for supporting a stack of sheets to be printed in predetermined spaced relation with said drum; feeding means for successively advancing sheets from said stack toward said drum; means interposed between said feeding means and said drum for receiving the sheets advanced by said means and advancing them independently thereof to printing relation between said drum and said impression roller; means retaining said roller spaced from said drum including a cam rotatable with said drum and operative upon arrival of said drum with said portion at a predetermined angular position about the drum axis for releasing said roller for movement toward the drum; and means preventing operation of said retaining means to release the roller responsive to failure of said interposed means to advance a sheet.

8. In paper feed mechanism for a duplicating machine or the like having a rotatable printing drum with an impression forming portion extending partly about its periphery; an impression roller rotatably mounted for movement toward and away from said drum and resiliently urged toward said drum for confining a sheet to be printed thereagainst; means forming a magazine for supporting a stack of sheets to be printed in predetermined spaced relation with said drum; feeding means for successively advancing sheets from said stack toward said drum; means interposed between said feeding means and said drum for receiving the sheets advanced by said means and advancing them independently thereof to printing relation between said drum and said impression roller; means retaining said roller spaced from said drum including a cam rotatable with said drum and operative upon arrival of said drum with said portion at a predetermined angular position about the drum axis to release said roller for movement toward the drum; means including a latch member preventing operation of said retaining means to release the roller; and means responsive to the advance of a sheet by said interposed means for causing said latch member to release said roller retaining means.

9. In a paper feed mechanism for a duplicating machine or the like having a rotatable printing drum: means forming a magazine for positioning and guiding a stack of sheets to be printed with respect to said drum and including an elevatable platform for supporting said stack with the top sheet at a predetermined elevation with respect to said drum; feeding means; means mounting said feeding means for movement toward and away from the top of the stack; said feeding means being engageable therewith when the top is at said elevation for successively advancing sheets therefrom toward printing relation with said drum; a control arm; means mounting said control arm for movement toward and away from the top of the stack; means moving said arm toward and away from said stack in accordance with the rotation of the drum; means for elevating said platform by small increments responsive to movement of said arm toward said stack in excess of a predetermined amount; and means including a pair of interengaging latch elements respectively on the feeding means and a stationary support operated by said arm to engage upon such excess movement for restraining said feeding means from engaging said stack.

10. In a paper feed mechanism for a duplicating machine or the like having a rotatable printing drum: means forming a magazine for positioning and guiding a stack of sheets to be printed with respect to said drum and including an

elevatable platform for supporting said stack with the top sheet at a predetermined elevation with respect to said drum; feeding means; means mounting said feeding means for movement toward and away from the top of the stack; said feeding means being engageable therewith when the top is at said elevation for successively advancing sheets therefrom into printing relation with said drum; a control arm; means mounting said arm for movement toward and away from the top of said stack; means moving said arm toward and away from said stack in accordance with the rotation of said drum and for elevating said platform in accordance with the movement of said arm; means operated in response to movement of said arm toward said stack in excess of a predetermined amount for restraining said feeding means from engaging said stack; and optionally operable means for restraining said feeding means from engaging said stack independently of movement of said control arm.

11. In a paper feed mechanism: means forming a magazine for a stack of sheets comprising spaced side walls and an end member for positioning said stack and an elevatable bottom for supporting the stack with the top sheet at a predetermined elevation with respect to said mechanism; a feed roller mounted for movement toward and away from said stack and when activated adapted to engage the top sheet thereof when at said predetermined elevation and advance said sheet from the stack; means for driving said roller; a control arm movable toward and away from the top of said stack; the top of said stack when at said elevation serving as a limit to the travel of said arm in one direction; means moving said control arm toward and away from said stack top; means operated by said arm upon movement past said limit preventing activation of said feed roller; and means for elevating said bottom to maintain the top of said stack substantially constant at said elevation.

12. In a paper feed mechanism: means forming a magazine for a stack of sheets comprising spaced side walls and an end member for positioning said stack and an elevatable bottom for supporting the stack with the top sheet at a predetermined elevation with respect to said mechanism; a continuously rotating feed roller; means mounting said roller for movement toward and away from said stack; said roller being adapted to engage the top sheet of said stack when at said predetermined elevation and advance said sheet from the stack; a control arm movable toward and away from the top of said stack; the top of said stack when at said elevation serving as a limit to the travel of said arm in one direction; means moving said control arm toward and away from said stack top; means operated by said arm upon movement past said limit preventing movement of said feed roller to engage said stack; and means for elevating said bottom to maintain the top of said stack substantially constant at said elevation.

13. In a paper feed mechanism for a duplicating machine or the like having a rotatable printing drum: means forming a magazine for locating a stack of sheets to be printed with respect to said drum and having an elevatable bottom for supporting the stack with the top sheet at a predetermined elevation with respect to said drum; means including a feed roller for advancing successive sheets from said stack to printing relation with said drum; means driving said feed roller; a first pivoted member rotatably mounting said roller for movement toward and away from the top of the stack; said roller being resiliently urged toward said stack; a control arm; a rockable member mounting said arm for movement of its outer end portion toward and away from the top of said stack; engagement of said end portion with said top when at its predetermined elevation serving as a normal limit to movement of said arm in one direction; means resiliently urging said arm toward said stack; means for elevating said bottom controlled by said arm; a cam member mounted for rotation with said drum; a lever pivotally mounted intermediate its ends and having a cam follower at one end engageable with said cam and means at its other end engageable with said pivoted member whereby rotation of said cam causes movement of said roller with respect to said stack; a second pivoted member having a cam follower engageable with said cam at a point angularly spaced about the axis of the cam from the first mentioned cam follower; means connecting said second pivoted member and said rock shaft whereby rotation of said cam causes movement of said arm with respect to said stack; means forming a latch surface on the first pivoted member; a latch member mounted for movement into and out of engagement with said latch surface and when in engagement supporting said roller out of contact with said stack; means resiliently urging said latch member out of engagement with said surface; and an element fixed on said rock shaft engageable with said latch member for urging said member into engagement with said surface upon movement of the control arm past said normal limit.

14. In a paper feed mechanism for a duplicating machine or the like having a rotatable printing drum: means forming a magazine for locating a stack of sheets to be printed with respect to said drum; said means providing an elevatable bottom for supporting the stack with the top sheet at a predetermined elevation with respect to said drum; means including a feed roller for advancing successive sheets from said stack to printing relation with said drum; means driving said feed roller; a first pivoted member rotatably mounting said roller for movement toward and away from the top of the stack; said roller being resiliently urged toward said stack; a control arm; a rockable member mounting said arm for movement of its outer end portion toward and away from the top of said stack; engagement of said end portion with said top when at its predetermined elevation serving as a normal limit to movement of said arm in one direction; means resiliently urging said arm toward said stack; means for elevating said bottom controlled by said arm; a cam member mounted for rotation with said drum; a lever pivotally mounted intermediate its ends and having a cam follower at one end engageable with said cam and means at its other end engageable with said pivoted member whereby rotation of said cam causes movement of said roller with respect to said stack; a second pivoted member having a cam follower engageable with said cam at a point angularly spaced about the axis of the cam from the first mentioned cam follower; means connecting said second pivoted member and said rock shaft whereby rotation of said cam causes movement of said arm with respect to said stack; means forming latch surfaces on the first pivoted member; a latch member mounted for movement into

and out of engagement with one of said latch surfaces and when in engagement supporting said roller out of contact with said stack; means resiliently urging said latch member out of engagement with said surface; an element fixed on said rock shaft engageable with said latch member for urging said member into engagement with said surface upon movement of the control arm past said normal limiting position; a second element mounted adjacent said rock shaft for movement independently thereof into and out of engagement with another of said latch surfaces and when in engagement maintaining said roller out of contact with said stack; and optionally operable means for moving said second element into and out of said engagement.

15. In a paper feed mechanism for a duplicating machine or the like having a rotatable printing drum: means forming a magazine for locating a stack of sheets to be printed with respect to said drum; said magazine having an elevatable bottom for supporting the stack with the top sheet at a predetermined elevation with respect to said drum; means including a feed roller for advancing successive sheets from said stack to printing relation with said drum; means driving said feed roller; a first pivoted member rotatably mounting said roller for movement toward and away from the top of the stack; said roller being resiliently urged toward said stack; a control arm; a rockable member mounting said arm for movement of its outer end portion toward and away from the top of said stack; engagement of said end portion with said top when at its predetermined elevation serving as a normal limit to movement of said arm in one direction; means resiliently urging said arm toward said stack; a cam member mounted for rotation with said drum; a lever pivotally mounted intermediate its ends and having a cam follower at one end engageable with said cam and means at its other end engageable with said pivoted member whereby rotation of said cam causes movement of said roller with respect to said stack; a second pivoted member having a cam follower engageable with said cam at a point angularly spaced about the axis of the cam from the first mentioned cam follower; means connecting said second pivoted member and said rock shaft whereby rotation of said cam causes movement of said arm with respect to said stack; means forming a latch surface on the first pivoted member; a latch member mounted for movement into and out of engagement with said latch surface and when in engagement supporting said roller out of contact with said stack; means resiliently urging said latch member out of engagement with said surface; an element fixed on said rock shaft engageable with said latch member for urging said member into engagement with said surface upon movement of the control arm past said normal limit; means for elevating said bottom including a rotatable member; a ratchet wheel for driving said member; and a pawl engaging said wheel and connected to move with said second pivoted member.

16. In a paper feed mechanism for a duplicating machine or the like having a rotatable printing drum: means for successively advancing sheets toward printing relation with said drum; a pair of rolls; means rotatably mounting said rolls in the path of sheet advance; the mounting of one of said rolls permitting movement of said roll toward and away from the other roll; means resiliently urging said one roll against the other roll; said rolls being normally stationary and in contact to prevent passage of said sheets; means including a gear sector for imparting predetermined angular rotation to one of said rolls in sheet advancing direction; gear means connecting said rolls for simultaneous rotation in opposite direction; a cam member rotatable with said drum for operating said gear sector upon arrival of said drum at a predetermined angular position about its axis; and means responsive to a predetermined angular advance of said drum from said position for moving said one roll from the other roll.

17. In a paper feed mechanism for a duplicating machine or the like having a rotatable printing drum: means for successively advancing sheets toward printing relation with said drum; a pair of rolls; means rotatably mounting said rolls in the path of sheet advance; the means mounting one of said rolls being operable to move said roll toward and away from the other roll; means resiliently urging said one roll to contact the other roll; said rolls being normally stationary and in contact to prevent passage of a sheet; means for imparting predetermined angular rotation to said rolls in sheet advancing direction including means connecting said rolls for simultaneous rotation in opposite directions; a gear sector engaging a pinion rotatably mounted on one of said rolls and resiliently urged in one direction; cam means rotatable with said drum for operating said gear sector in the opposite direction upon movement of said drum to a predetermined angular position about its axis; means forming a one way clutch for causing said pinion to drive its associated roll upon movement of said gear sector in said opposite direction; and means responsive to a predetermined angular advance of said drum from said position for moving the movably mounted roll away from the other roll.

18. In a paper feed mechanism for a duplicating machine or the like having a rotatable printing drum: means for successively advancing sheets toward printing relation with said drum; a pair of rolls; means rotatably mounting said rolls in the path of sheet advance; the means mounting one of said rolls being operable to move said roll toward and away from the other roll; means resiliently urging said one roll to contact the other roll; said rolls being normally stationary and in contact to prevent passage of a sheet; means for imparting predetermined angular rotation to said rolls in sheet advancing direction including means connecting said rolls for simultaneous rotation in opposite directions; a gear sector engaging a pinion rotatably mounted on one of said rolls and resiliently urged in one direction; cam means rotatable with said drum for operating said gear sector in the opposite direction upon movement of said drum to a predetermined angular position about its axis; said cam means having a surface providing a period of dwell during which the gear sector and rolls are stationary; a rise for moving the sector in roll operating direction; a return for allowing the sector and pinion to resume their initial positions; and an offset allowing overtravel of the sector and pinion past said initial positions whereby lost motion between the gear sector and roll is prevented during said period of dwell; means forming a one-way clutch for causing said pinion to drive its associated roll upon movement of said gear sector in said opposite direction; and means responsive to a predetermined angular advance of said drum from said

position for moving the movably mounted roll away from the other roll.

19. In a paper feed mechanism for a duplicating machine or the like having a rotatable printing drum: means for successively advancing sheets toward printing relation with said drum; a pair of rolls; means rotatably mounting said rolls in the path of sheet advance; the means mounting one of said rolls being operable to move said roll toward and away from the other roll; means resiliently urging said one roll to contact the other roll; said rolls being normally stationary and in contact to prevent passage of a sheet; means for imparting predetermined angular rotation to said rolls in sheet advancing direction including means connecting said rolls for simultaneous rotation in opposite directions; a gear sector engaging a pinion rotatably mounted on one of said rolls and resiliently urged in one direction; cam means rotatable with said drum for operating said gear sector in the opposite direction upon movement of said drum to a predetermined angular position about its axis; means forming a one way clutch for causing said pinion to drive its associated roll upon movement of said gear sector in said opposite direction; a second cam rotatable with said drum; a pivoted arm resiliently urged in one direction and movable in the opposite direction by said cam; said arm having an extension; and means forming a lost motion connection between said extension and said movable roll mounting means whereby operation of said arm by said cam releases said mounting means for movement to roll contacting position.

20. In a paper feed mechanism for a duplicating machine or the like having a rotatable printing drum: an impression roller; means mounting said roller for movement toward and away from the drum; said roller being resiliently urged toward said drum to confine a sheet thereagainst during printing; means for successively advancing sheets to printing relation between said drum and said roller including a pair of gating rolls between which the sheets are passed; a member mounted for angular movement adjacent said rolls and having a projection extending transversely of said rolls; said member being movable between positions in which said projection extends across the path of sheet advance between said rolls and a position in which said path is unobstructed; said member being resiliently urged to position the projection across said path; said projection having a surface engageable by a sheet advancing between said rolls and movable thereby to clear said path and impart angular movement to said member; means including a pivoted arm for moving said impression roller away from said drum when said drum reaches a predetermined angular position about its axis; a latch member connected for movement with said angularly movable member and engageable with said arm for maintaining said impression roller spaced from said drum when said projection is in path obstructing position.

21. In a paper feed mechanism for a duplicating machine or the like having a rotatable printing drum: an impression roller; means mounting said roller for movement toward and away from the drum; said roller being resiliently urged toward said drum to confine a sheet thereagainst during printing; means for successively advancing sheets to printing relation between said drum and said roller including a pair of gating rolls between which the sheets are passed; means for driving said rolls in accordance with the angular position of said drum; means rotatably mounting one of said rolls for movement toward and away from the other roll; said one roll being resiliently urged toward the other roll; a member mounted for angular movement adjacent said rolls and having a projection extending transversely of said rolls; said member being movable between positions in which said projection extends across the path of sheet advance between said rolls and a position in which said path is unobstructed and resiliently urged to position the projection across said path; said projection having a surface engageable by a sheet advancing between said rolls and movable thereby to clear said path and impart angular movement to said member; a pivoted arm having oppositely directed extensions engageable respectively with said impression roller mounting means and the means movably mounting said one roll; means including a cam rotatable with said drum for operating said arm to release the impression roller for movement toward said drum and thereafter move said one pressure roll from contact with the other roll; and a latch member connected for movement with said angularly movable member and engageable with said arm for preventing movement thereof to release said impression roller and move said one roll when said projection is in path obstructing position.

22. In paper feed mechanism for a duplicating machine or the like having a rotatable printing drum: an impression roller rotatably mounted for movement toward and away from said drum and resiliently urged toward said drum for confining a sheet to be printed thereagainst; means forming a magazine for supporting a stack of sheets to be printed in predetermined spaced relation with said drum; feeding means for successively advancing sheets from said stack toward said drum; means interposed between said stack and said drum for restricting advance of the sheets by said feeding means; said interposed means being adapted to grip successive sheets and initiate advance thereof toward printing relation between said roller and said drum; means including a cam member rotatable with said drum and having a pair of angularly spaced lobes; and means including a cam follower operated by one of said lobes upon arrival of said drum at a predetermined angular position about its axis to cause said interposed means to grip and advance successive sheets toward printing relation between said drum and said roller; advance of said cam thereafter causing said cam follower to engage the cam intermediate said lobes whereby to cause said roller to engage said drum and impart rotation to the roller before said sheet reaches printing relation therewith; further advance of the cam causing the other of said lobes to engage said cam follower after arrival of said sheet in printing relation whereby said interposed means is caused to release said sheet.

23. In a paper feed mechanism for a duplicating machine having a rotatable drum; an impression roller; means mounting said roller for movement toward and away from said drum; means resiliently urging said roller toward said drum; means for feeding a paper sheet between the drum and the roller including a pair of feed rolls; means mounting one of said feed rolls for movement toward and away from the other feed roll; a movable member having a lost motion connection with said mounting means for said

one feed roll and having contact with said mounting means for said impression roller; means mounting said movable member for movement between a position for maintaining said one feed roll in operative relation to the other feed roll and for contacting said mounting means for said impression roller to hold the impression roller spaced from the drum and a position for releasing said mounting means for said impression roller and holding said one feed roll out of operative relation to the other feed roll; an operating arm connected with said movable member operable for controlling movement of said movable member into and out of said positions; and means operated by rotation of said drum for so operating said arm.

24. In a paper feed mechanism for a duplicating machine having a rotatable drum; an impression roller; means mounting said roller for movement toward and away from said drum; means resiliently urging said roller toward said drum; means for feeding a paper sheet between the drum and the roller including a pair of feed rolls; means mounting one of said feed rolls for movement toward and away from the other feed roll; a movable member having a lost motion connection with said mounting means for said one feed roll and having contact with said mounting means for said impression roller; means mounting said movable member for movement between a position for maintaining said one feed roll in operative relation to the other feed roll and for contacting said mounting means for said impression roller to hold the impression roller spaced from the drum and a position for releasing said mounting means for said impression roller and for holding said one feed roll out of operative relation to the other feed roll; an operating arm connected with said movable member operable for controlling movement of said movable member into and out of said positions; means operated by rotation of said drum for so operating said arm; latch means for restraining operation of said arm by said drum operated means and holding said arm in the position to hold the impression roller spaced from the drum as well as to hold said one feed roller in operative relation to the other feed roller; and means operated by a paper sheet between said rolls for releasing said latch means.

25. In a paper feed mechanism for a duplicating machine having a rotatable drum; an impression roller; means mounting said roller for movement toward and away from said drum; means resiliently urging said roller toward said drum; means for feeding a paper sheet between the drum and the roller including a pair of feed rolls; means mounting one of said feed rolls for movement toward and away from the other feed roll; a movable member having a lost motion connection with said means for mounting said one feed roll and having contact with said mounting means for said impression roller; means mounting said movable member for movement between a position for maintaining said one feed roll in operative relation to the other feed roll and for contacting said mounting means for said impression roller to hold the impression roller spaced from the drum and a position for releasing said mounting means for said impression roller and holding said one feed roll out of operative relation to the other feed roll; a cam mounted to rotate with said drum; an operating arm connected with said movable member for controlling movement of said movable member into and out of said positions, a cam follower on said arm, and means resiliently urging said arm into a position in which said cam follower is engageable by said cam.

26. In a paper feed mechanism for a duplicating machine having a rotatable drum; an impression roller; means mounting said roller for movement toward and away from said drum; means resiliently urging said roller toward said drum; means for feeding a paper sheet between the drum and the roller including a pair of feed rolls; means mounting one of said feed rolls for movement toward and away from the other feed roll; a movable member having a lost motion connection with said mounting means for said one feed roll and having contact with said mounting means for said impression roller; means mounting said movable member for movement between a position for maintaining said one feed roll in operative relation to the other feed roll and for contacting said mounting means for said impression roller to hold the impression roller spaced from the drum and a position for releasing said mounting means for said impression roller and holding said one feed roll out of operative relation to the other feed roll, a cam mounted to rotate with said drum; an operating arm connected with said movable member for controlling movement of said movable member into and out of said positions, a cam follower on said arm; means resiliently urging said arm into a position in which said cam follower is engageable by said cam; latch means for normally holding said arm in a position with the follower spaced from contact with the cam and with said movable member in the position in which the impression roller is spaced from the drum and said one feed roll is in operative relation to the other feed roll; and means operable by the presence of a sheet of paper between said feed rollers for releasing said latch means.

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