June 30, 1953 A. J. ALBRECHT 2,643,881

FRONT STOP ASSEMBLY

Filed July 1, 1949 3 Sheets-Sheet 1

FIG. 1

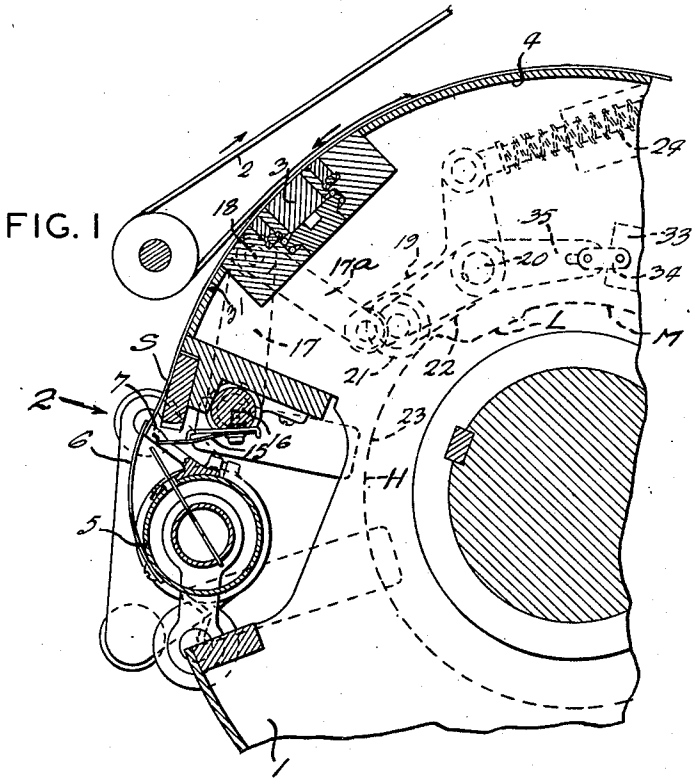
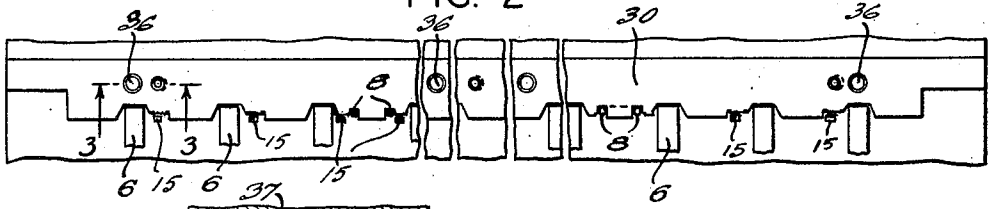


FIG. 2



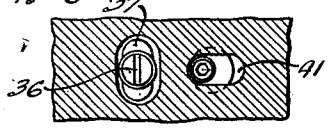


FIG. 4

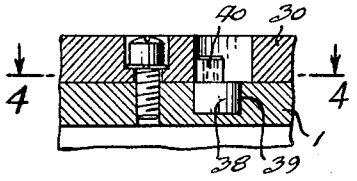


FIG. 3

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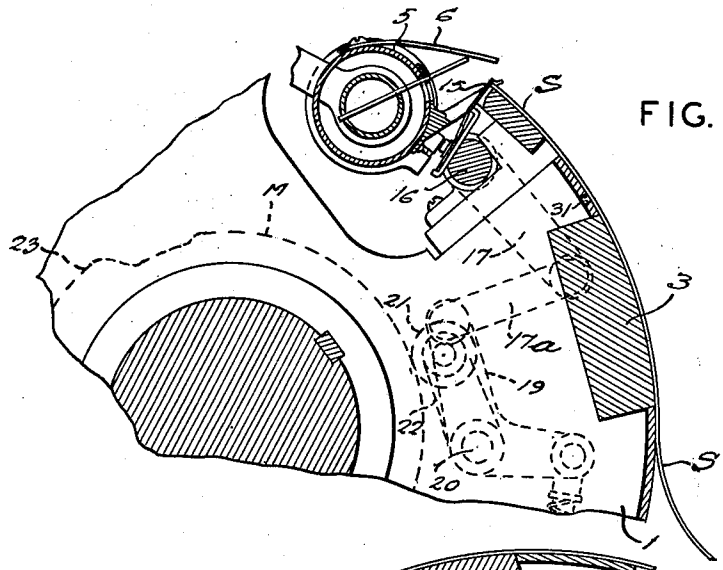


FIG. 5

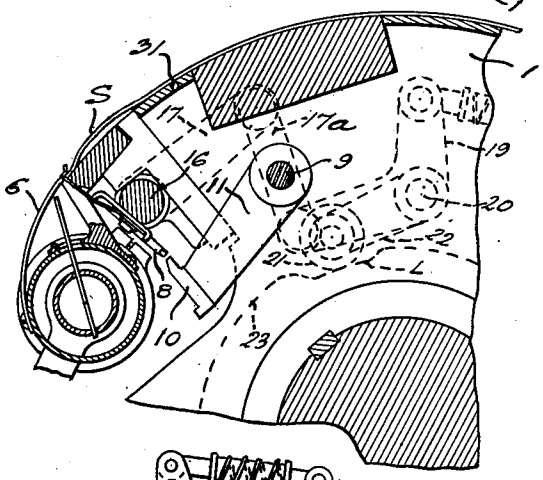


FIG. 6

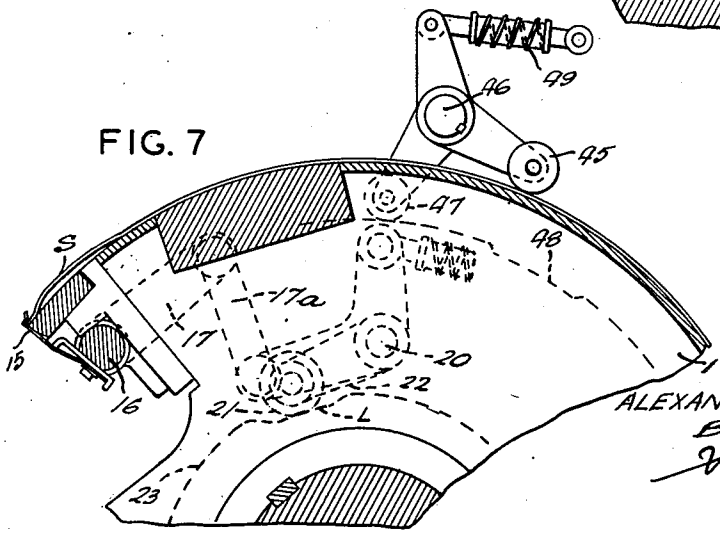


FIG. 7

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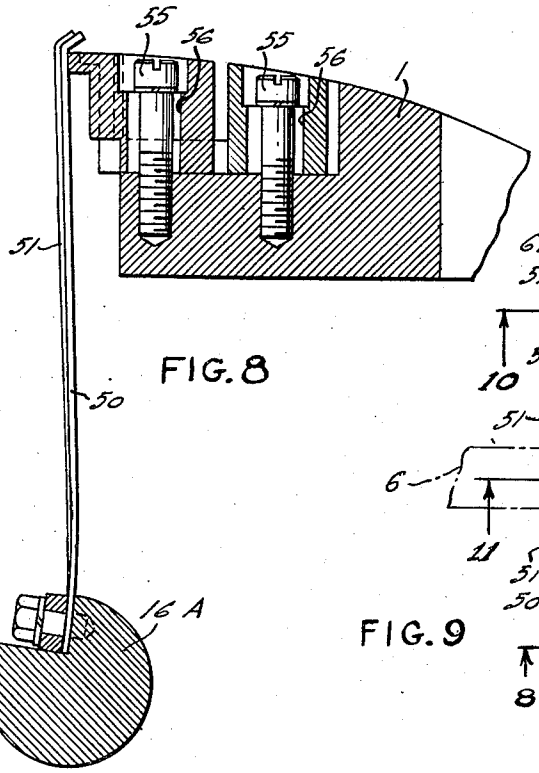


FIG. 8

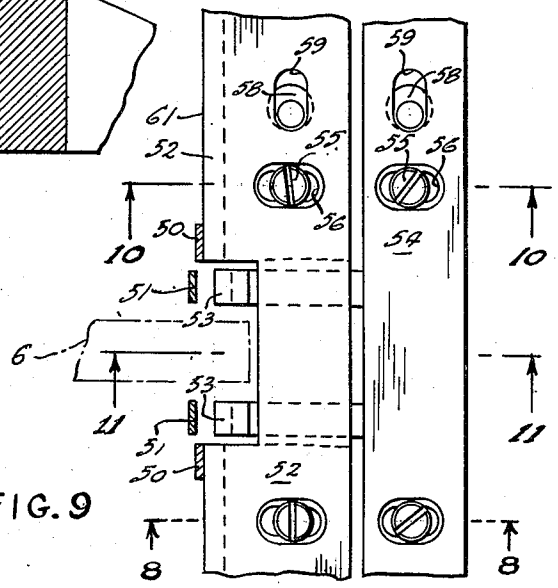


FIG. 9

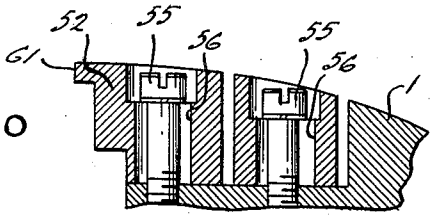


FIG. 10

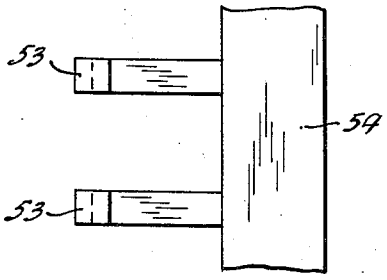


FIG. 12

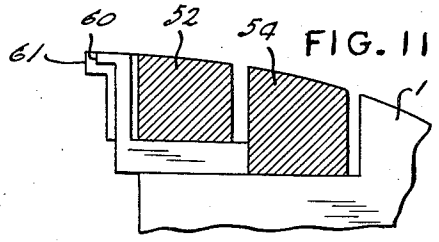


FIG. 11

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UNITED STATES PATENT OFFICE

2,643,881

FRONT STOP ASSEMBLY

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Application July 1, 1949, Serial No. 102,681

7 Claims. (Cl. 271—53)

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This invention relates to improvements in sheet handling mechanisms and more particularly to methods and apparatus for registering successive sheets as they are fed to a printing machine or other device.

The invention is primarily intended for use in registering sheets on a so-called registering cylinder of the general type shown, for example in Eckhard Patent No. 2,286,032. In such a mechanism, the sheet to be registered is fed on to a rotating cylinder and is positioned thereon. At a given point in the operating cycle, after the sheet has been properly positioned, it is taken by grippers, which may be carried by a so-called gripper bar supported on moving sprocket chains as in the Eckhard patent, or which may be carried by a rotating transfer or printing cylinder. At some point in the cycle, the sheet is tested to see whether it is properly registered or not, and if not, means are customarily provided for rejecting it and for tripping the printing or other mechanisms at the appropriate times in the operating cycle of the printing machine so as to prevent one cylinder from printing on another in the absence of the rejected sheet.

In such devices, registration of both the front edge of a sheet and the side edge is ordinarily necessary and is accomplished by traction belts or by suction or other means associated with the registering cylinder. Such mechanisms ordinarily advance the sheet on the cylinder against a set of front stops and then slide it crosswise of the cylinder against lateral registering stops. The sheet is then taken by the grippers and conveyed through the machine or is rejected, depending upon whether the registration has been properly performed. For detecting improper longitudinal registry a number of detector fingers may be utilized, as in the Eckhard patent above mentioned, and the failure of any of these fingers to engage the leading edge of the sheet at an appropriate point will result in the rejection of the sheet. The result has been that a sheet which is properly registered laterally and longitudinally, except for being slightly cocked or tilted, will be rejected. It is an object of the present invention to provide for acceptance of such sheets and for eliminating the faulty positioning thereof.

In mechanisms of this character, there are, moreover, certain inherent relationships between the forces necessarily applied, for producing front registration and those employed for producing lateral registration, both as to magnitude and as to order of duration and application, which

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present such difficulties that compromise of design is necessary, and the best overall performance may involve a sacrifice of the best performance of some of the component elements. It is an object of the present invention to provide a sheet registering cycle which reduces to a minimum, interference between the longitudinal and lateral registering mechanisms.

With these and other objects which will appear in the following full description in mind, the invention consists in the combinations and arrangements of parts and methods of sheet registration which will now first be fully described in connection with the accompanying drawing and then be more particularly pointed out in the claims.

In the drawing:

Figure 1 is a cross section, somewhat schematic, through a sheet registering cylinder and showing the operating elements embodying the invention, together with such known and conventional elements as are necessary for an understanding of the invention;

Figure 2 is an elevation view of a portion of the cylinder of Figure 1, showing the location of the front stops, sheet grippers, sheet detector fingers and associated parts, as seen in the direction of arrow 2 of Figure 1;

Figure 3 is a detail section on the line 3—3 of Figure 2;

Figure 4 is a section on the line 4—4 of Figure 3;

Figures 5 and 6 are sections similar to Figure 1, but showing the cylinder in different rotary positions with the parts in correspondingly different positions;

Figure 7 is a section similar to Figure 1, showing a modified form of the invention;

Figure 8 is a section on an enlarged scale showing the front registering fingers and cooperating parts according to a still further modified form of the invention;

Figure 9 is a plan view of the mechanism of Figure 8 with certain parts removed;

Figure 10 is a section on the line 10—10 of Figure 9;

Figure 11 is a section on the line 11—11 of Figure 9; and

Figure 12 is a detail plan view of an element of Figures 8 to 11.

The elements of a registering cylinder and the parts cooperating therewith are fully shown in Eckhard Patent 2,286,032 and in Huck Patent 2,231,914, and will not be repeated herein. It is sufficient to note that the registering cylinder 1,

shown fragmentarily in Figures 1, 5 and 6, will be supplied with sheets *s* by conveyor tapes or other suitable mechanism and will transfer the sheets to a gripper mechanism carried by suitable sprocket chains, as in the Huck and Eckhard patents or by other mechanisms.

The registering cylinder 1 supports a sheet *s* which is fed to the cylinder in a position generally corresponding to Figure 5. The sheet is tested for front registration in a position corresponding to Figure 6 and is taken by the grippers in a position corresponding to Figure 1. Meanwhile, the sheet will have been advanced on the cylinder by tapes 2 or other mechanisms, as shown more fully, for example, in the Huck and Eckhard patents, so as to come against the front stops and will have been shifted laterally by a suction bar apparatus 3 so as to come against lateral registering stops as shown in those patents.

The prior practice, as exemplified in the Huck and Eckhard patents referred to above, has been to propel the sheet on the surface of a cylinder, as by means of tapes, exerting a frictional drag thereon until the leading edge comes in contact with a front stop. If the leading edge is at a proper angle to the cylinder, it will engage one or more front stops and its motion will cease. If, however, it is slightly cocked, one corner may engage a front stop while another corner is not yet in engagement. For this reason, the belts 2 are ordinarily given sufficient traction to permit them to advance the backward corner of a cocked sheet after the leading corner has engaged the stops, thus straightening out the sheet on the cylinder so that its leading edge is true. Thereafter, the suction bar 3 or other lateral registration device is brought into play and drags the sheet laterally against side stops. The greater the pressure of the propelling tapes 2, the more will be the resistance to the lateral registering movement and the proper correlation of the two movements thus presents some difficulties. According to the present invention, the sheet is advanced on the cylinder until it encounters a front stop and if the sheet is slightly cocked it may be permitted to remain so until after the lateral registration has been accomplished. Thereafter, the front stops push the leading edge of the sheet backward slightly so that it buckles as indicated in Figure 6, thus permitting the leading edge of a cocked sheet to be squared up while the remainder of the sheet may remain in a slightly cocked position. At this point, the grippers are permitted to take the sheet and since the edge which is presented to them is in correct position, no front registry error will be created. Any error in side registry will be negligible, because a side edge of the sheet will be accurately positioned against a lateral stop that engages it at a point quite near its leading edge. Secondly, since the leading corner of a cocked sheet will be pushed back and buckled more than the trailing corner, it will be apparent that the leading edge is swung around prior to being taken by the grippers in such a direction as to swing the front edge of the sheet even closer to theoretically accurate registry. In the embodiment illustrated in Figures 1 to 6, inclusive, the majority of the elements shown are of known form. The cylinder in general comprises a shell 4 which forms the cylindrical sheet supporting surface. This shell is interrupted and a gap is formed to receive a gripper bar 5 having upper and lower jaws 6 and 7. These jaws may be closed to grasp a sheet, as shown in Figures 1 and 6, or may be held open to receive a sheet, as shown in Figure 5, the usual cam mechanism being employed for this purpose.

For completeness of disclosure, front registry detector fingers 8 together with a detector shaft 9 and a bar 10, carried thereby by means of arms 11, for controlling the operation according to the position of the fingers 8, are shown in Figure 6, and the position of the detector fingers is indicated in Figure 2. These elements are omitted from other figures so as to clarify the showing of the essential parts which are characteristic of the present invention. The detector shaft and associated elements may be constructed according to the disclosure of the Eckhard of Huck patents referred to or in any other convenient manner, which permits a rotary or rocking movement of the shaft 9 when all detector fingers 8 engage the front edge of a sheet or which permits such a movement if any of the detector fingers is thus engaged, either type of operation being adaptable to the present invention, depending upon the time in the registering cycle at which the parts are arranged to operate.

The front register stops take the form of a number of spring fingers 15 carried by the front register shaft 16, which is rotatably journaled in the cylinder and given its proper movement at the proper times in the registering cycle by a cam mechanism. This mechanism comprises an arm 17 fixed to shaft 16 and connected at 18 to a link 17*a*, which in turn is connected to one arm of a bell crank 19, which is fixed to shaft 20 which, in turn, carries cam follower roller 21 by means of an arm 22. This roller runs on a stationary cam 23, positioned outside the cylinder in the usual manner and which has high, low and medium sections H, L and M respectively. The bell crank 19 urges the roller 21 against the cam 23, being yieldingly forced in the counterclockwise direction by a poppet spring 24. The cam 23 is so arranged that roller 21 will be on the medium level of the cam (Figure 5) at the time when the sheet is advanced by the propelling tapes and is stopped by one or more of the front registry fingers 15. Thereafter, the suction bar 3 carrying the lateral registration device will operate. Next, when the roller 21 reaches the low section of cam 23 (Figure 6), front registry shaft 16 will be rotated slightly in the clockwise direction forcing the front stop fingers 15 against a register bar 30, so that the portions of these fingers engageable by the sheet will be accurately aligned by the register bar 30. All portions of the front edge of the sheet protruding out beyond this final registering position will be forced back so that the sheet is more or less buckled, as shown in Figure 6. At this point, the gripper jaws will close to take the sheet. Immediately thereafter roller 21 comes to the high section of cam 23, thus rocking the fingers 15 backwardly and out of engagement with the sheet, so it will not be torn by the fingers when the sheet and gripper mechanism 5 starts to leave the cylinder, as indicated in Figure 1.

To prevent the buckling movement of the front stops from pushing the sheet bodily backward on the cylinder, suction holes 31 are provided in the cylinder surface, vacuum being applied thereto through a connection (not shown) leading to a valve box 33 containing suitable valve mechanism controlled by a valve lever 34 which, in turn, is connected by means of a slotted connection, as indicated in Figure 1, to an arm 35 fixed to the shaft 20, previously referred to. This

mechanism is shown only in Figure 1, and is arranged so as to apply suction only during the interval when roller 21 is on the low section L of cam 23.

The register bar 30 is arranged so as to dispose the front stops 15 in final registering position (Figure 6) either in a straight line contained within an axial plane of the cylinder or in a curve or other form as may be required for stretching or shrinking the sheets to compensate for irregularities. The effect of such distortion of the registering bar 30 is fully discussed in the Eckhard patent referred to above. The mechanism for distorting the bar as required is similar to that of the Eckhard patent and comprises a number of bolts 36 across the length of the bar and operating in circumferentially elongated bolt holes 37 as shown in Figures 3 and 4, this mechanism holding the bar from axial movement and permitting fastening it down to the cylinder in various twisted or distorted positions, as required. The bar is bent by means of eccentric studs 38 turnable in seats 39 in the cylinder 1 and having heads 40 received in axially elongated slots 41. By turning one of these studs any desired portion of the bar 30 may be shifted circumferentially of the cylinder as desired. The spring of the front stops 15 permits rocking of the shaft 16 to engage all stops against the register bar 30 even though some stops may engage this bar earlier than others.

Instead of employing suction holes 31 to hold the sheet against the cylinder while the front edge is being buckled, other means may be employed for this purpose. Figure 7, which corresponds generally to Figure 6, illustrates such a modification, pressure rollers 45 carried by a shaft 46 and moved by a cam follower roller 47 cooperating with a cam 48 and urged thereagainst by a poppet spring 49, being provided, and operating to press the sheet down against the cylinder during the interval when it is buckled.

In another form of the invention, which is illustrated in Figures 8 to 12 inclusive, the front registry mechanism is modified, providing full and accurate control both of the position of the stops engaging the sheet at the time of its preliminary registration and of the position of the stops engaging the sheet when buckled into final register. In this form of the invention, the front register shaft 16*a*, which may be otherwise similar to front register shaft 16 and may be moved by similar mechanisms, carries two sets of front stop spring fingers 50 and 51 respectively, the fingers 50 being set slightly ahead of the fingers 51 so as to engage earlier. Fingers 50, which are utilized for preliminary registration, cooperate with the preliminary register bar 52 and fingers 51 cooperate with projections 53 of the final registration bar 54. The bar 54 is fastened onto the cylinder, as indicated in Figure 8, by means of bolts 55 in oval slots 56 (corresponding to bolts 36 and slots 37 of Figures 2 to 4), and is bent or adjusted along its length by means of eccentrics 58 and slots 59 (corresponding to the eccentrics 38 and slots 41 of Figures 2 to 4). These mechanisms operate in a similar way to that described above in connection with the embodiment of Figures 2 to 4, with the result that the bar 54 may be bent or adjusted along its length as desired. Projections 53 of the bar 54 pass under the bar 52 and their upper ends 60 are positioned for engagement by the spring fingers 51. Bar 52 is similarly adjusted or bent by means of bolts and eccentrics 55 and 58. This

bar also is bolted down to the cylinder but is recessed as indicated in Figures 9 to 11 to accommodate the projections 53 of the bar 54. Spring stops 50 engage the edge 61 of the bar 52. Bar 52 will also be formed with notches for accommodating the grippers and detector fingers as in the case of the bar 30 shown in Figures 2 to 4. In the operation of this embodiment, the shaft 16*a* will be in the position of Figure 8 as the sheet is first brought up against the stops, and accordingly the sheet will be stopped by one or more of the fingers 50. Since the spring fingers are pressed against the edge 61 of the bar 52 at this time, accurate preliminary registration with reference to this bar is attained. This preliminary registration is completed when the sheet is engaged by one or more of the stops 50. After the lateral registration of the sheet, shaft 16*a* moves again, bringing the spring fingers 51 into contact with projections 53 of the bar 54 and thus buckling the leading edge of the sheet as in the embodiment of Figures 1 to 6, at which point the sheet may be taken by the grippers operating in the spaces between projections 53.

What is claimed is:

1. In a sheet registering mechanism comprising a rotatable registering cylinder and means for advancing a sheet thereon for registering the same, and in combination, preliminary register mechanism within the registering cylinder and movable between a protracted position for stopping the advance of a sheet over the cylinder and a retracted position below the surface of the cylinder and final register mechanism operable while the sheet is so stopped and comprising means for forcing the leading edge of the sheet backwardly with reference to the cylinder into a predetermined position for registering the same with reference to the cylinder, and means operable in timed relation to the rotation of the cylinder for operating first the preliminary register mechanism, and thereafter and after rotation of the cylinder through a predetermined angle operating the final register mechanism.

2. Sheet registering mechanism according to claim 1, having also means for holding the sheet rearwardly of its leading edge against the cylinder for permitting buckling of its leading edge when forced back while preventing bodily movement of the sheet over the cylinder.

3. Sheet registering mechanism according to claim 1, in which the final register mechanism comprises a plurality of spring members spaced across the cylinder and circumferentially adjustable register bar mechanism for positioning the spring members which force back the leading edge of the sheet.

4. Sheet registering mechanism according to claim 3, in which the preliminary register mechanism also comprises a plurality of spring members spaced across the cylinder and circumferentially adjustable register bar mechanism for positioning the spring members.

5. Sheet registering mechanism according to claim 3, having also means for holding the sheet rearwardly of its leading edge against the cylinder for permitting buckling of its leading edge when forced back while preventing bodily movement of the sheet over the cylinder.

6. In a sheet registering mechanism comprising a rotatable registering cylinder, driven tapes for advancing a sheet thereon and means for moving the sheet laterally thereon for registering the same, and in combination, front stop mechanism mounted in the cylinder for stopping

the advance of a sheet on the cylinder, front register mechanism for forcing the leading edge of the stopped sheet backwardly into a predetermined registered position, and operating mechanism synchronized with the rotation of the cylinder for operating first the front stop mechanism, and thereafter, and after a time lapse sufficient to permit lateral registration, operating the front register mechanism for forcing back the leading edge of the sheet.

7. In a sheet registering mechanism comprising a rotatable registering cylinder, means for advancing a sheet thereon and means for moving the sheet laterally thereon for registering the same, and in combination, front stop mechanism for stopping the advance of a sheet on the cylinder, front register mechanism mounted in the cylinder for forcing the leading edge of the stopped sheet backwardly into a predetermined registered position, means for holding the sheet rearwardly of its leading edge against the cylinder to permit buckling of the leading edge while

preventing bodily movement on the cylinder, and operating mechanism synchronized with the rotation of the cylinder for operating first the front stop mechanism, and thereafter, and after a time lapse sufficient to permit lateral registration, simultaneously operating the front register mechanism for forcing back the leading edge of the sheet and the means for holding the sheet against the cylinder.

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