

June 9, 1942.

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2,286,032

SHEET REGISTERING MECHANISM FOR PRINTING MACHINES

Filed Feb. 11, 1941

4 Sheets-Sheet 1

Fig. 1.

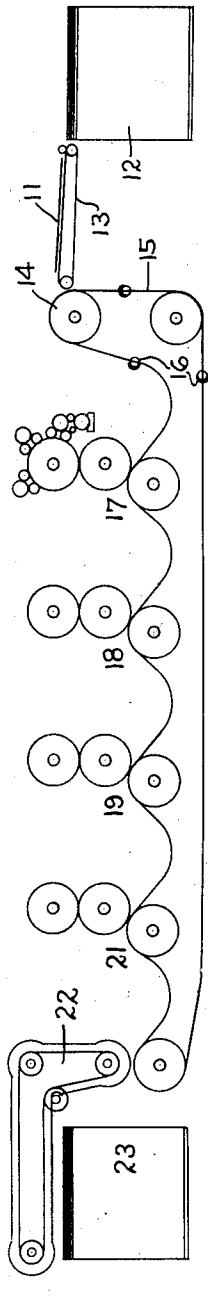
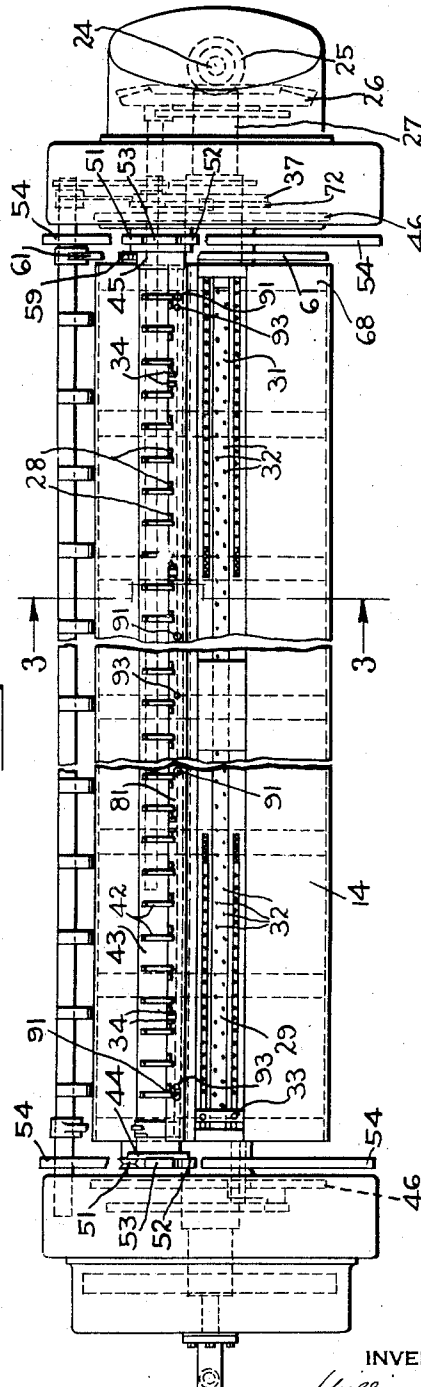


Fig. 2.



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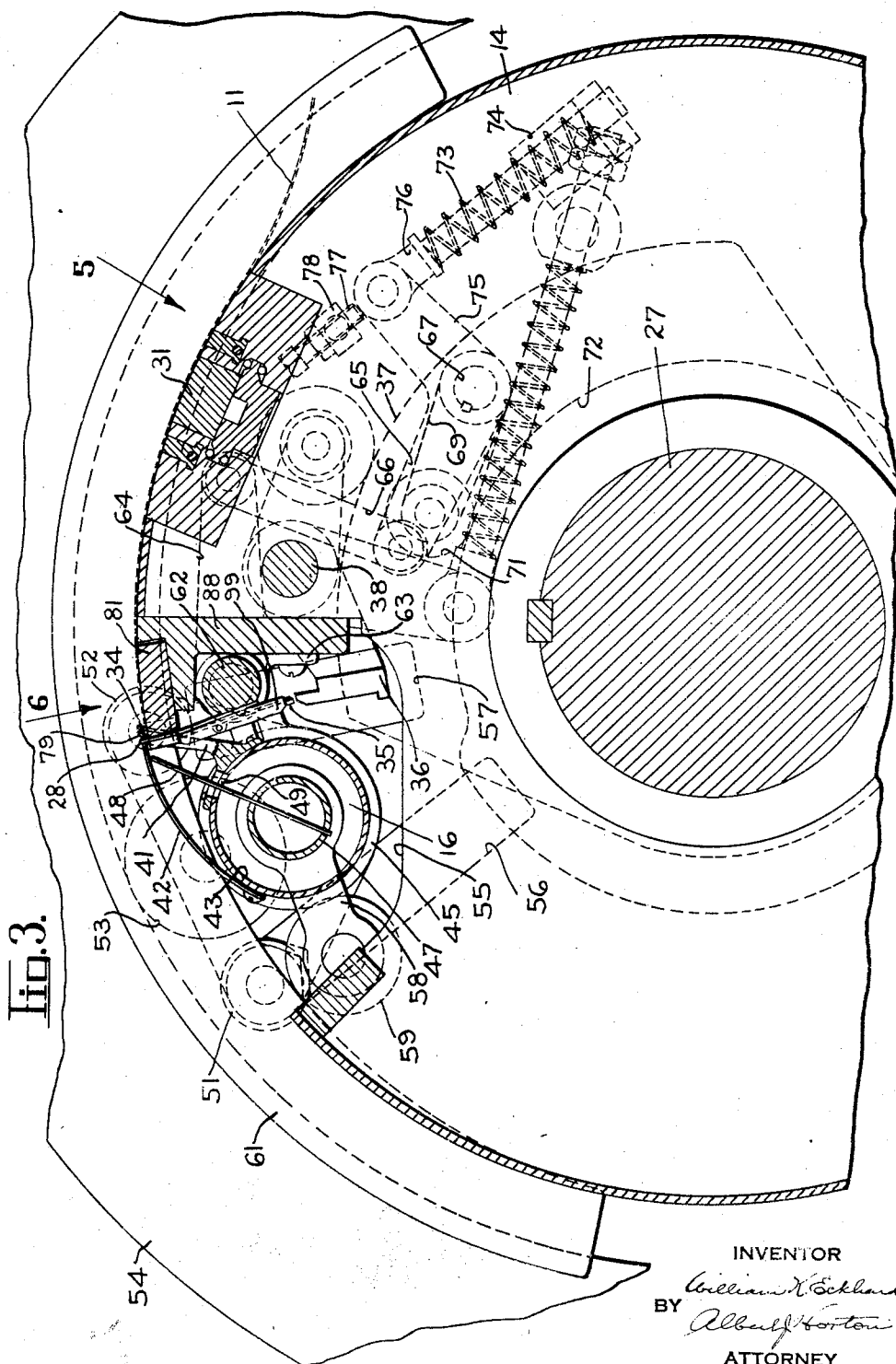
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Fig. 5.

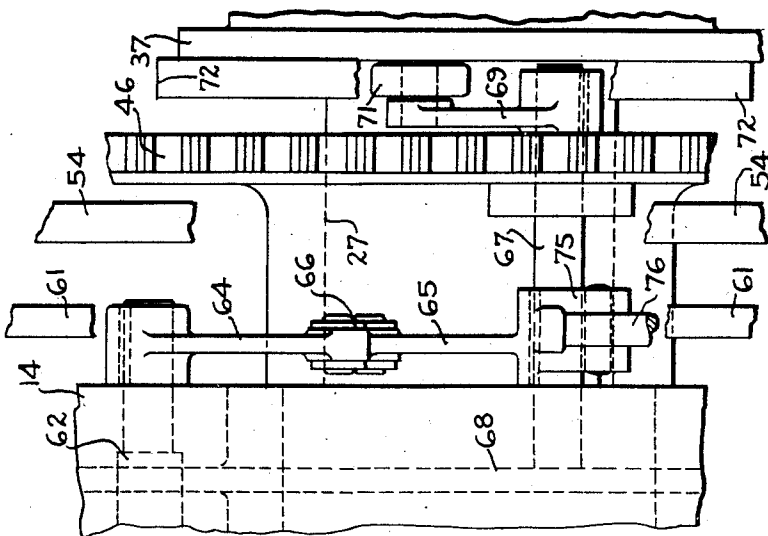
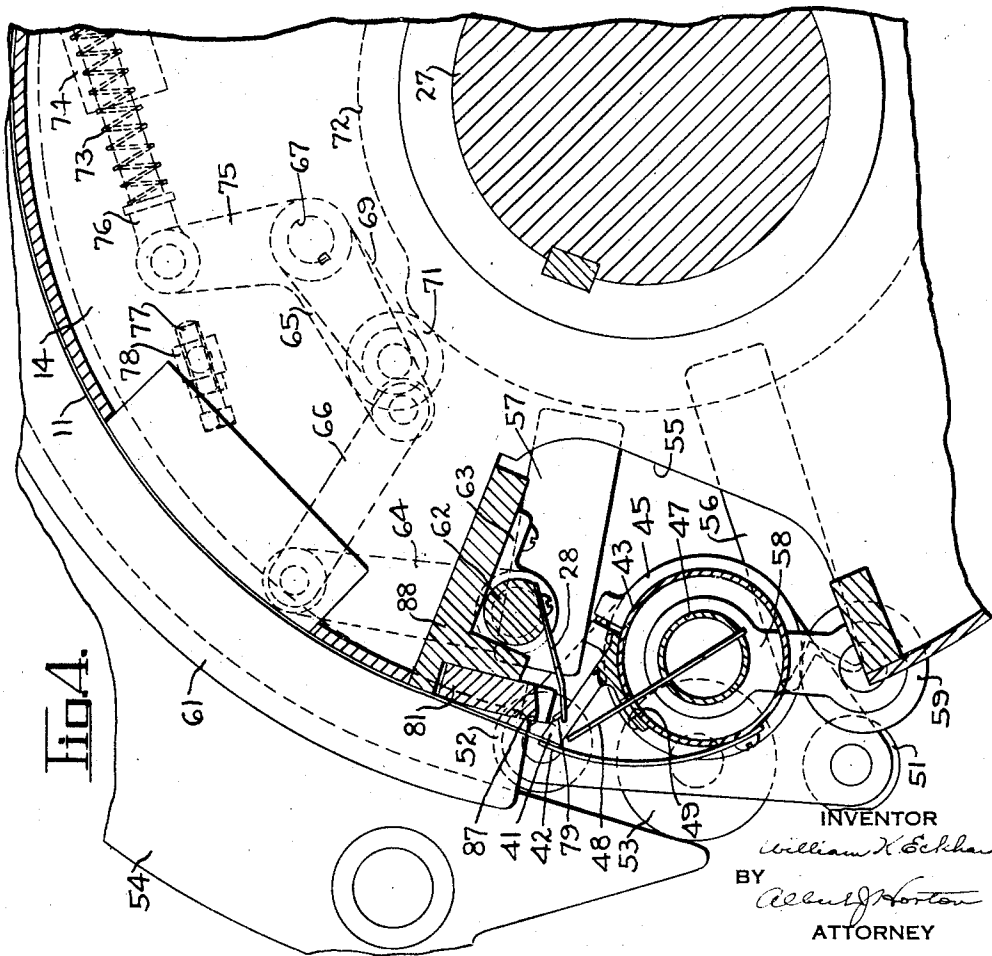


Fig. 4.



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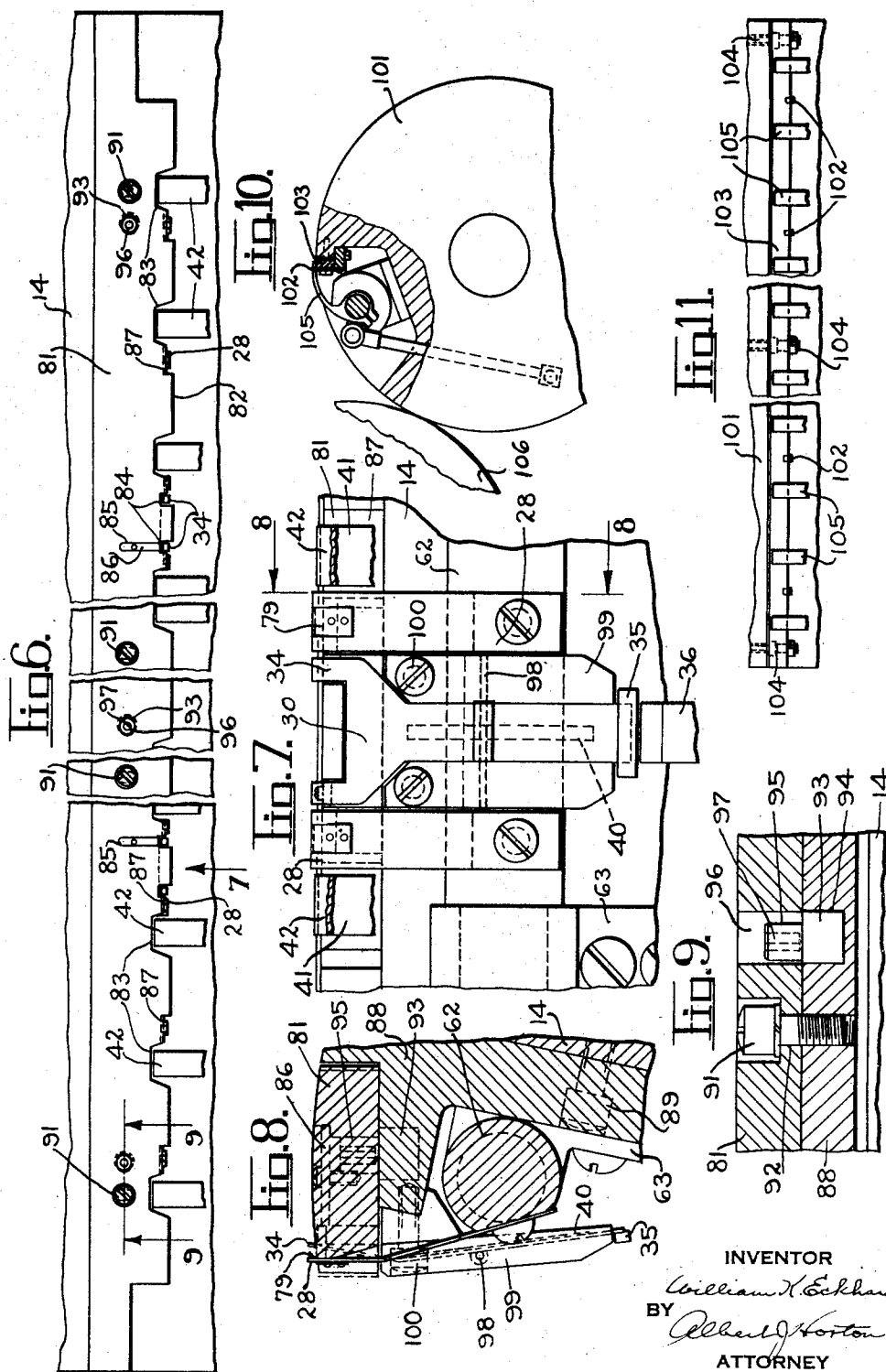
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SHEET REGISTERING MECHANISM FOR PRINTING MACHINES

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4 Sheets-Sheet 4



UNITED STATES PATENT OFFICE

2,286,032

SHEET REGISTERING MECHANISM FOR
PRINTING MACHINES

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Application February 11, 1941, Serial No. 378,341

18 Claims. (Cl. 271—7)

This invention relates to sheet fed rotary printing machines and more particularly to improvements in mechanisms for registering sheets upon a rotating cylinder of a machine adapted to operate upon the sheets.

In some instances, it is desirable that sheets, being fed to a rotary printing machine, be accurately registered upon a sheet carrying device before they are presented to the printing units of the printing machine, and for such a purpose the mechanism shown and fully described in Patent No. 2,231,914, granted February 18, 1941, was developed and has been found to be very efficient. In that form, a sheet receiving and registering cylinder is included in the mechanism to register the sheet upon a carrying device which subsequently presents it to the printing cylinders. This invention contemplates, as one of its objects, improvements in the mechanism shown in the above mentioned patent, whereby certain advantages will be obtained.

In other instances, it is preferable to feed sheets directly to the printing cylinders, and without the use of a separate sheet receiving and registering cylinder, the sheets, in this latter instance, being received and gripped by means directly connected to and carried by one of the cylinders of a printing unit. It is therefore contemplated as another object of this invention to provide sheet registering means adapted for use with the sheet receiving cylinder of a printing unit.

In both instances, it is desirable to feed the sheets to the sheet receiving cylinder against a sheet registering member, or series of such members into registered position in respect to sheet gripping means carried by a sheet carrying device, or by a cylinder of the printing unit, and this invention contemplates as another of its objects the provision of an improved form of sheet registering device.

Another object of this invention is to provide an adjustable sheet engaging member on, or series of such members spaced apart axially along, a sheet receiving cylinder whereby sheets being delivered thereto may be slightly stretched, contracted, or otherwise disposed on the cylinder to so register them, as to compensate for certain irregularities in either the printing plates, or in the paper, which frequently are present.

Still another object of this invention is to provide an adjustable sheet engaging member, or members, for use in a sheet registering mechanism, whereby unevenness or curvature of the

forward edge of the sheet may be compensated for.

A further object is to provide a sheet registering mechanism having provision to move sheet engaging members out of engagement with the sheet edge after a sheet has been placed in register and grippers have engaged it, preparatory to carrying the sheet from the receiving cylinder into the machine, or toward another printing unit.

It is also an object of this invention to provide a sheet registering mechanism of generally improved construction, whereby the same will be simple, durable and inexpensive in construction, as well as convenient, practical, serviceable and efficient in use.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts, and in the details of construction hereinafter described and claimed.

Preferred embodiments of the invention are illustrated in the accompanying drawings, wherein:

Figure 1 is a diagrammatic view of a multi-color printing machine with which the sheet registering mechanism of this invention may be associated;

Figure 2 is a top plan view of a sheet receiving cylinder having the sheet registering mechanism of this invention associated therewith;

Figure 3 is an enlarged view of a portion of a registering cylinder, partly in section showing the mechanism as seen in the direction of the arrows 3 in Figure 2 and showing one of the adjustable sheet stopping and locating members in position to act upon a sheet;

Figure 4 is a view similar to Figure 3, but showing the parts in their respective positions substantially at the time a sheet is being carried away from the registering mechanism;

Figure 5 is a partial view of the operating levers and cams for the sheet stopping and locating members, looking in the direction of arrow 5 in Figure 3;

Figure 6 is an enlarged and broken top plan view of the adjustable sheet stopping and locating mechanism of this invention, looking in the direction of arrow 6 in Figure 3;

Figure 7 is an enlarged view of a part of the mechanism shown in Figure 6, looking in the direction of arrow 7 in Figure 6;

Figure 8 is a sectional view of the parts shown in Figure 7 as seen in the direction of arrows 8—8 of Figure 7 and showing the adjusting means

for the sheet stopping and locating members moved out of sheet engaging position;

Figure 9 is an enlarged broken sectional view taken on the line 9-9 of Figure 6;

Figure 10 is a broken away end view of a printing cylinder carrying the registering mechanism of the invention; and

Figure 11 is a fragmentary top view of a portion of the printing cylinder shown in Figure 10, showing the adjusting means for the sheet stopping and locating members.

The features and principles of this invention have been shown in the drawings in cooperation with the structure of a sheet registering mechanism of the form shown in the hereinbefore mentioned patent. In the present application many of the details of that mechanism have been omitted for the sake of brevity and clearness, and hence reference is made to the aforesaid patent for a full and complete disclosure of a machine to which the invention may be applied. In the invention as herein disclosed, a sheet 11 (Figure 1), is fed from a pile 12, by means including a belt 13, to a sheet receiving and registering cylinder 14. A sheet carrying device is provided, which includes continuously moving chains 15 arranged to be directed to and over the cylinder 14, and which have sheet conveyor members or gripper bars 16 spaced therealong. The conveyor members 16 are adapted to take sheets while on the cylinder 14 after they have been registered and to successively present them to printing units 17, 18, 19 and 21, and then to a sheet delivering mechanism 22 by which they are delivered to a pile 23.

In this present form of mechanism, as in the mechanism shown in the before-mentioned patent, the sheet receiving cylinder 14 is driven from the printing machine driving means through a shaft 24 (Figure 2), and bevel gears 25 and 26, the gear 26 being on a shaft 27 of the cylinder 14. When a sheet 11 is fed to the cylinder 14, its forward edge is engaged by a series of sheet registering fingers 28 (Figures 2, 3 and 4), which locate it in proper position. Mechanism including bars 29 and 31 (Figure 2), each having a plurality of holes 32 therein is provided, and by means of atmospheric pressure upon the sheet 11, caused by exhausting the air from the holes 32, the sheet 11 is pressed against the bars 29 and 31 and the sheet may thus be shifted by axial movement of the bar 29 and against a stop 33 to locate the sheet laterally upon the cylinder 14. Means is also provided to detect absence of a sheet 11 from the cylinder 14, or a lack of proper register of a sheet thereon, and includes a body member 30 (Figure 7) having spaced apart sheet detecting fingers 34 which, when properly engaged by the sheet 11 (Figures 3 and 8) are swung forwardly thereby (in respect to the direction of rotation of the cylinder 14) to dispose an abutment block 35, carried on the lower end of the member 30, out of the path of the end of a rocking lever 36 secured to a shaft 38 and actuated by a stationary cam 37, thereby controlling the action of cylinder tripping mechanism and also mechanism for stripping a misregistered sheet from the cylinder 14, all of which is fully explained in Patent No. 2,231,914. A leaf spring 40 (Figures 7 and 8) is provided and disposed back of the member 30 to urge it and the fingers 34 rearwardly, and to move the abutment block 35 into the path of the rocking lever 36.

The sheet conveyor members 16 spaced along

the chain 15 (Figures 1, 3 and 5) and as herein shown, include an outer tube 43, to which are secured posts 41 and spring gripper fingers 42. The outer tube 43 extends the length of the cylinder 14 and is secured to a chain 15 at each end of the cylinder by means of holders 44 and 45 (Figure 2). Each chain 15 is led over and driven by a sprocket 46 (Figure 2) secured on the shaft 27 at each end of the cylinder 14. A smaller diameter tube 47 is disposed concentrically within the outer tube 43, and also extends the length of the cylinder 14. The inner tube 47 is arranged to rotate relatively to the outer tube 43 and carries a plurality of bars 48 which extend through openings 49 in the outer tube 43 and are adapted to engage the gripper fingers 42 to force them away from the posts 41 when the tube 47 is rotated in one direction, thus opening the grippers 16 to release a sheet gripped thereby.

Each of the holders 44 and 45 are provided with a pair of spaced apart rollers 51 and 52, and also a roller 53 of larger diameter journaled substantially midway between them. The rollers 53 are each adapted to be engaged by an accurately shaped stationary guide 54 (Figures 3 and 4) adjacent to each end of the cylinder 14 when the sheet conveyor member 16 engages the cylinder 14, and presses the member 16 into an opening 55 provided in the cylinder to receive it, the rollers 51 and 52 being pressed against the ends of locating plates 56 and 57 respectively (Figure 4). In this manner the sheet conveyor members 16 are maintained in register with the cylinder 14 while moving with it.

An arm 58 secured to the inner tube 47 extends outwardly through the holder 45 and has a roller 59 journaled thereon (Figures 2 and 3). The roller 59 is adapted to engage the inner edge of a stationary arcuate plate cam 61. This cam when engaged by the roller 59, through the arm 58 rotates the tube 47 to cause the blades 48 to press outwardly against the spring gripper fingers 42 to forcibly move them from engagement with the posts 41, thus opening the fingers. The plate cam 61 is so arranged that it will move the blades 48 to permit the fingers 42 to swing toward the post 41 to grip the edge of a sheet 11 therebetween before the fingers 42, with the chain 15, ride off the sprockets 46, and thus carry a sheet 11 from the cylinder 14. The guide 54, which holds the conveyor members 16 in place in the cylinder opening 55 is arranged to gradually release the same from the cylinder 14 shortly after the sheet 11 has been gripped between the fingers 42 and the posts 41.

The timing of the plate cam 61 is such that the sheet 11 is gripped while it is still in engagement with the sheet registering fingers 28. As the guides 54, through the rollers 53, release the conveyor members 16 from the cylinder 14, the tangential movement of the conveyor members tends to pull the gripped sheet edge past the fingers 28, and in consequence, there is a tendency to bend or tear the edge of the sheet. To obviate this, means are provided to move the sheet registering fingers 28 out of the path of the sheet edge after it has been gripped between the fingers 42 and the post 41. The means to so move the fingers 28 includes a shaft 62 to which the fingers 28 are secured. The shaft 62 extends through and is journaled within the cylinder 14 in brackets 63 secured within the cylinder opening 55.

One end of the shaft 62 has an arm 64 (Figure 5) secured thereto which is connected to an

arm 65 by a link 66 (Figures 3 and 4). The arm 65 is secured to a stud shaft 67 extending outwardly from a cylinder end plate 68 (Figure 5) and in which it is journaled. The shaft 67 also extends through and is journaled in the sprocket 46 and has an arm 69 secured upon its outer end. A roller 71 carried by the arm 69 is arranged to ride on a stationary cam 72 (Figures 3 and 4) being pressed thereagainst by a spring 73, reacting between a bracket 74 secured to the cylinder end plate 68, and an arm 75 integral with the arm 65, the spring 73 being supported by a rod 76 pivoted to the end of the arm 75. An adjustable stop screw 77 mounted in a post 78 extending outward from the end plate 68 is provided to limit the movement of the arm 75 by the spring 73, and thus in turn the engagement of the roller 71 on the cam 72. The cam 72 is timed to act on the roller 71 to cause the sheet registering fingers 28 to be withdrawn, as shown in Figure 4, as the conveyor members 16 tend to leave the cylinder 14. To insure that the forward edges of the sheets 11 will lie flat against the cylinder 14, lip portions 79 of the fingers 28 are bent rearwardly to guide this sheet edge downwardly against the cylinder 14. The portion or lip 79 may, as shown, be a separate piece secured on the finger 28.

Occasionally due to changes in the condition of paper or to overcome inaccuracies in cutting the sheets, or perhaps to compensate for inaccuracy in the printing form, conditions arise when it is desirable, in order to obtain accurate register in multicolor printing to slightly stretch the sheets 11 at their forward ends, and on other occasions, it is desirable to contract the sheets 11 at this point. At still other occasions it is desirable to set the sheets at a slight angle to the axis of the printing cylinder. When any such conditions exist, the means herein disclosed is particularly efficient and useful to properly and accurately register it with the printing forms.

Occasionally the forward edges of the sheets 11 being delivered to the machine are curved outwardly, and at other times being curved inwardly at the center. To properly and accurately register such sheets, the sheet registering fingers 28 as shown herein are made adjustable to compensate for such uneven sheet edge conditions.

The means for adjusting the sheet registering fingers 28 to register a sheet under such conditions includes a bar 81 which extends the length of the cylinder 14 and is adjustably mounted and secured thereon to the rear (in respect to the direction of rotation of the cylinder 14) of the resilient sheet registering fingers 28 (Figures 2 to 4 and 6 to 9). The bar 81 is provided at its forward edge 82 (Figure 6) with a series of recesses 83 which form clearance spaces for the posts 41 and spring gripper fingers 42 of the conveyor members 16 when they are disposed in the openings 55.

A series of recesses 84 also are provided in the forward edge 82 of the bar 81 to form clearance spaces for the sheet detecting fingers 34. Slots 85, extending rearwardly from a determined number of the recesses 84, are provided to receive short bars 86 (Figure 8) which extend forwardly to engage the finger 34 and prevent it moving rearwardly to cause actuation of the sheet stripping and cylinder tripping means hereinbefore referred to. The bars 86 are disposed in the slots 85 when a sheet 11 is not of sufficient width that its forward edge will engage and press against the detecting fingers 34 adjacent the bar 86.

Between the recesses 83 and the recesses 84 and adjacent each of the recesses 83, the bar is recessed somewhat less in depth to form shoulders 87 adapted to have the spring sheet registering fingers 28 rest thereagainst. The bar 81 is secured to the cylinder 14 by being adjustably secured to a bracket 88, disposed in the cylinder opening 55 and attached to the cylinder by screws 89. The means to adjustably secure the bar 81 to the bracket 88, and in turn to the cylinder 14, includes spaced apart clamp screws 91 (Figure 9), which pass through holes 92 provided in the bar 81 (and elongated in a direction peripherally about the cylinder 14), the screws 91 being screw-threaded into the brackets 88. Preferably three or more buttons 93 are provided, one adjacent each end of the bar 81 and at least one intermediate the same. These are seated in counter-bored holes 94 provided in the brackets 88. The buttons 93 are provided with upwardly directed shanks 95 to which they are eccentric, and these shanks 95 extend into openings 96 provided in the bar 81, the openings 96 being elongated in a direction lengthwise of the bar 81 to prevent the shank 95 binding therein when it and the button are rotated and the bar is bowed for purposes of adjustment. A wrench socket 97 is provided in each shank 95 by which it may be rotated by a suitable tool inserted therein.

By loosening the bar clamping screws 91 and selectively rotating the eccentric buttons 93, the bar may be bowed either forwardly or rearwardly as desired, or set at an angle to the axis of the cylinder to compensate for any of the inaccuracies mentioned. For instance, should it be desired to bow the sheets 11 forwardly at the center to contract them at their rear edges, the intermediate eccentric button 93 will be rotated to bow the bar 81 forwardly at its center. The series of sheet registering fingers 28 will then be held in position to bow the edge of each sheet 11 forwardly at its center when the sheet is forced forward by the feeding mechanism, thus drawing its side edges together and shortening its trailing edge. In like manner, the end buttons 93 may be rotated to spring the ends of the bar 81 forwardly, to bow each sheet rearwardly and thus tend to stretch its trailing edge. Other uneven or angular conditions obviously can be compensated for, by selecting the proper button, or buttons 93, to be rotated.

An improved structure is herein disclosed for attaching the detecting fingers 34 to the cylinder 14 (Figures 7 and 8). These fingers are pivoted on a pin 98 between spaced apart members of a bracket 99 which is detachably secured to the cylinder 14 by screws 100. While assembling the finger 34 to the bracket 99 by means of the pin 98, the leaf spring 40 is disposed in position between the finger 34 and the bracket 99. By this arrangement, the finger 34 together with its pivotal mounting, the spring 40, and the bracket 99, may be removed as a unit from the cylinder 14 by removal of the screws 100.

By the use of the herein disclosed structure, sheets fed to a multicolor or other printing machine will be accurately registered and may be transferred from a receiving cylinder without having their edges bent, torn or otherwise damaged.

The features and principles of this invention obviously are not limited to use with a separate sheet receiving and registering cylinder, such as hereinbefore described, but may be operably associated with an impression, or other cylinder of

a machine, adapted to receive and carry sheets to be operated upon. Such a use is illustrated in Figures 10 and 11 wherein an impression cylinder 101 of a printing machine is shown having sheet grippers carried directly thereon. In this instance, sheet registering fingers 102 are provided to be engaged by sheets delivered to the cylinder 101. A bar 103 similar in many respects to the bar 81, herein described, is provided to position the sheet registering fingers 102 to compensate for inaccuracies requiring correction.

In this instance, the arrangement for adjusting the bar 103 is somewhat different from that disclosed above, to suit structural conditions. The bar 103 is set into the cylinder 101 in position to have the spring sheet registering fingers 102 rest thereagainst, and is secured to the cylinder by collar screws 104, in this instance three, one at each end and the other intermediate the ends of the bar 103 and screw-threaded into the cylinder wall. Selective rotation of one or more of the screws 104 will bow the bar 103 as required to effect a desired correction. The bars 103, in this instance, are arranged to act as the gripper pad, cooperating with the usual gripper fingers 105 to grip a sheet edge therebetween. In this arrangement, the impression cylinder is arranged to cooperate with a printing cylinder 106.

While there has been disclosed herein two forms in which the invention may be embodied in practice, it will be understood that it may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiments be considered in all respects as illustrative and not restrictive, and it will be further understood that each and every novel feature and combination present in or possessed by the mechanism herein disclosed forms a part of the invention included in this application.

What I claim is:

1. In a sheet registering mechanism for a printing machine, a rotatable cylinder adapted to receive sheets, sheet registering members carried by the cylinder and by which sheets delivered thereto are registered, means to take sheets from the cylinder, and means to move the sheet registering members out of sheet engaged position previous to movement of the sheet taking means from the cylinder.

2. In a sheet registering mechanism for a printing machine, a rotatable cylinder adapted to receive sheets, sheet registering members carried by the cylinder and by which sheets delivered to the cylinder are registered, means on the cylinder against which the sheet registering members are adapted to rest, the said sheet registering members being movable peripherally in respect to the cylinder, and adjusting devices to adjust said means and thereby move the sheet registering members peripherally with respect to the cylinder.

3. In a sheet registering mechanism for a printing machine, a cylinder adapted to receive sheets, means associated with the cylinder to grip sheets delivered thereto, a plurality of members carried by the cylinder and against which the sheets are pressed when delivered to the mechanism to register them on the cylinder, means to remove sheets from the cylinder, and means to move the members out of sheet engaging position previous to the operation of the sheet removing means.

4. In a sheet registering mechanism for a printing machine, a cylinder adapted to receive

sheets, means moving with the cylinder to grip a sheet delivered thereto and to remove it from the cylinder, a plurality of members carried by the cylinder and against which the sheets are pressed to register them on the cylinder, adjustable means against which the members normally rest and operable to simultaneously position the members in desired relative positions along the cylinder to compensate for an inaccurate condition of the edges of the sheets, and means to move the members out of sheet engaging position subsequent to gripping the sheet and previous to removing it from the cylinder.

5. In mechanism to register a sheet upon a cylinder adapted to operate upon the sheet, a plurality of resilient sheet registering fingers carried by the cylinder and adapted to be engaged by the forward edge of a sheet delivered thereto, a bar against which the fingers abut and means to bow the bar to simultaneously adjust the position of some of the sheet registering fingers peripherally in respect to the cylinder.

6. In mechanism to register a sheet upon a cylinder adapted to receive the sheet, a plurality of resilient sheet registering fingers carried by the cylinder and adapted to be engaged by the forward edge of a sheet delivered thereto, a bar extending axially along the cylinder and engaging the sheet registering fingers, and means to adjust a portion of the bar peripherally in respect to the cylinder to simultaneously move a number of the sheet registering fingers in the same direction.

7. In mechanism to register a sheet upon a cylinder adapted to operate upon the sheet, a plurality of resilient sheet registering fingers carried by the cylinder and adapted to be engaged by the forward edge of a sheet delivered thereto, means to simultaneously adjust a number of the sheet registering fingers peripherally in respect to the cylinder, and cam operated means to simultaneously move all of the sheet registering fingers away from the adjusting means.

8. In mechanism to register a sheet upon a cylinder adapted to operate upon the sheet, a plurality of members carried by the cylinder and adapted to be engaged by the forward edge of a sheet delivered thereto, a bar extending axially along the cylinder and engaging the members, means to adjust a portion of the bar peripherally in respect to the cylinder to simultaneously move a number of the members in the same direction, and cam operated means to simultaneously move all of the members out of engagement with the bar.

9. In a printing machine, a cylinder adapted to receive sheets, means to register a sheet on the cylinder including a member against which a sheet is pressed when it is delivered to the cylinder, means to grip a sheet pressed against the member, and means to move the member from engagement with the sheet while the sheet is gripped by the said sheet gripping means.

10. In a printing machine, a cylinder adapted to receive sheets to be acted upon thereby, means to register a sheet on the cylinder including a member against which a sheet is pressed when it is delivered to the cylinder, means to grip a sheet pressed against the member, cam means to actuate the sheet gripping means, means to move the member from engagement with the sheet while the sheet is held by the gripping means, and cam means to actuate the said member moving means.

11. In a printing machine, a cylinder adapted to receive sheets to be acted upon thereby, means to register a sheet on the cylinder including a member against which a sheet is pressed when it is delivered to the cylinder, means to grip a sheet pressed against the member, a bar supported on and bendable in a direction peripherally of the cylinder and against which the member normally rests, means to bend the bar to move the member, and means to move the member away from the bar after the sheet has been gripped by the said sheet gripping means.

12. In mechanism to register a sheet upon a cylinder adapted to operate upon the sheet, a plurality of members carried by the cylinder and adapted to be engaged by the forward edge of a sheet delivered thereto, angularly disposed lips extending rearwardly from the members to guide a sheet downwardly against the periphery of the cylinder, and adjustable means to simultaneously adjust a number of the members peripherally in respect to the cylinder.

13. In a printing machine, a cylinder adapted to receive sheets to be acted upon thereby, means to register a sheet on the cylinder including a member against which a sheet is pressed when it is delivered to the cylinder, means to grip a sheet pressed against the member, angularly disposed lips extending rearwardly from the members to guide a sheet downwardly against the periphery of the cylinder, and means to remove the member from sheet engaged position after the sheet has been gripped by the said sheet gripping means.

14. In a rotating cylinder, a mechanism to register a sheet carried thereon, including a plurality of members adapted to be engaged by the forward edge of a sheet delivered to the cylinder, a swingable finger having an end normally in position to be engaged by the sheet as it is delivered to the cylinder, a spring for urging the finger into sheet engaging position, a bracket upon which the finger is pivoted and by which the spring is carried, and common removable means to secure the finger and the spring to the bracket and the bracket to said cylinder.

15. In a printing machine, a sheet detector, a rotating cylinder adapted to receive and register a sheet thereon, and a sheet detector mechanism mounted on the cylinder and adapted to engage the forward edge of a sheet presented to the cylinder, the sheet detector mechanism including a plurality of detector units each readily detachable from the cylinder, and including a bracket, a sheet engaging member pivotally supported on the bracket, and a spring adapted to bias the sheet engaging member toward a sheet presented to the cylinder.

16. In a printing machine, a cylinder adapted to receive sheets, a plurality of separately movable fingers carried by the cylinder to be engaged by and to register a sheet thereon, a bendable bar extending along the cylinder and against which the said fingers rest, and means to bend the bar to move some of the fingers in respect to the other fingers.

17. In mechanism to register a sheet upon a cylinder adapted to receive sheets, a plurality of resilient fingers normally in alignment axially along and carried by the cylinder and arranged to be engaged by the forward edge of a sheet as it is delivered thereto, a bendable bar carried by the cylinder and disposed thereon to be engaged by the said fingers, and means to bend the bar to press certain of the fingers out of alignment with the other fingers.

18. In mechanism to register a sheet upon a cylinder adapted to receive sheets, a plurality of resilient fingers normally in alignment axially along the cylinder and arranged to be engaged by the forward edge of a sheet as it is delivered to the cylinder, a rockable shaft carried by the cylinder and to which the fingers are secured, a bendable bar carried by the cylinder and disposed thereon to be engaged by the said fingers, means to bend the bar to press some of the fingers out of alignment with the other fingers, and means to rock the shaft to simultaneously move all of the fingers away from the bar.

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