June 16, 1953 A. J. ALBRECHT 2,642,283

SHEET REGISTERING MECHANISM

Filed July 1, 1949 6 Sheets-Sheet 1

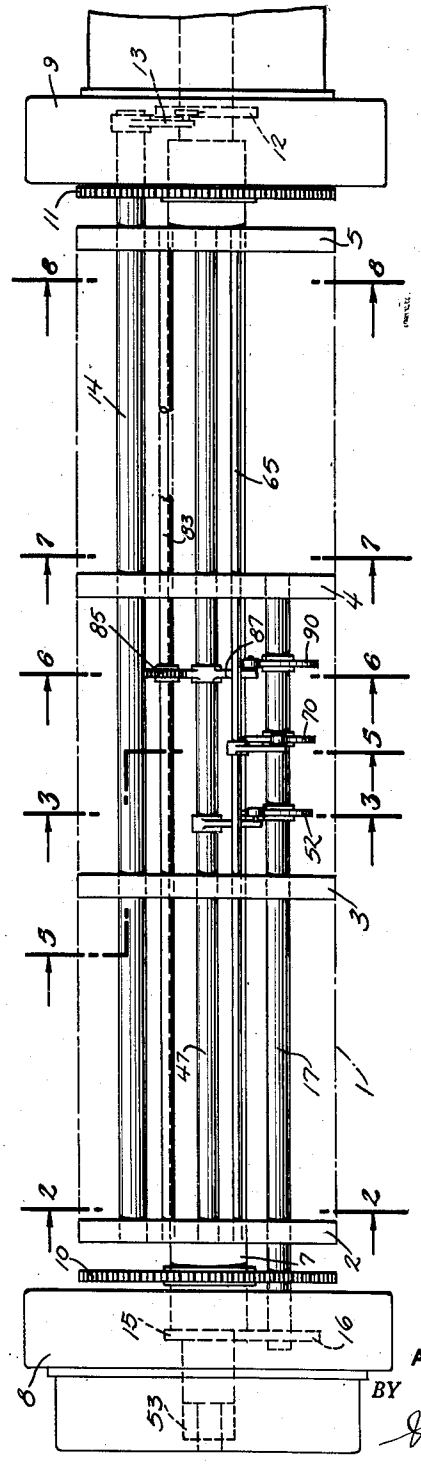

FIG. 1.

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June 16, 1953 A. J. ALBRECHT 2,642,283

SHEET REGISTERING MECHANISM

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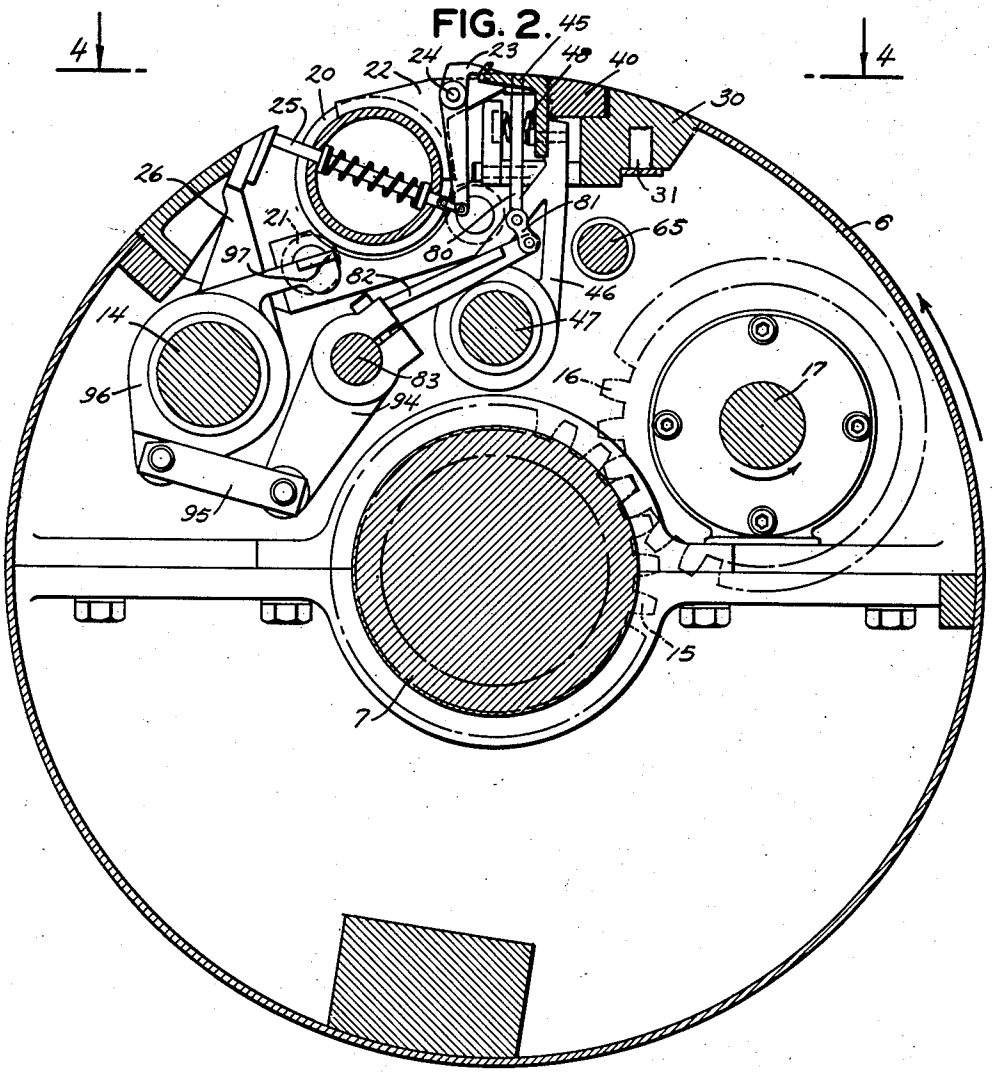
FIG. 2.



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SHEET REGISTERING MECHANISM

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FIG. 3.

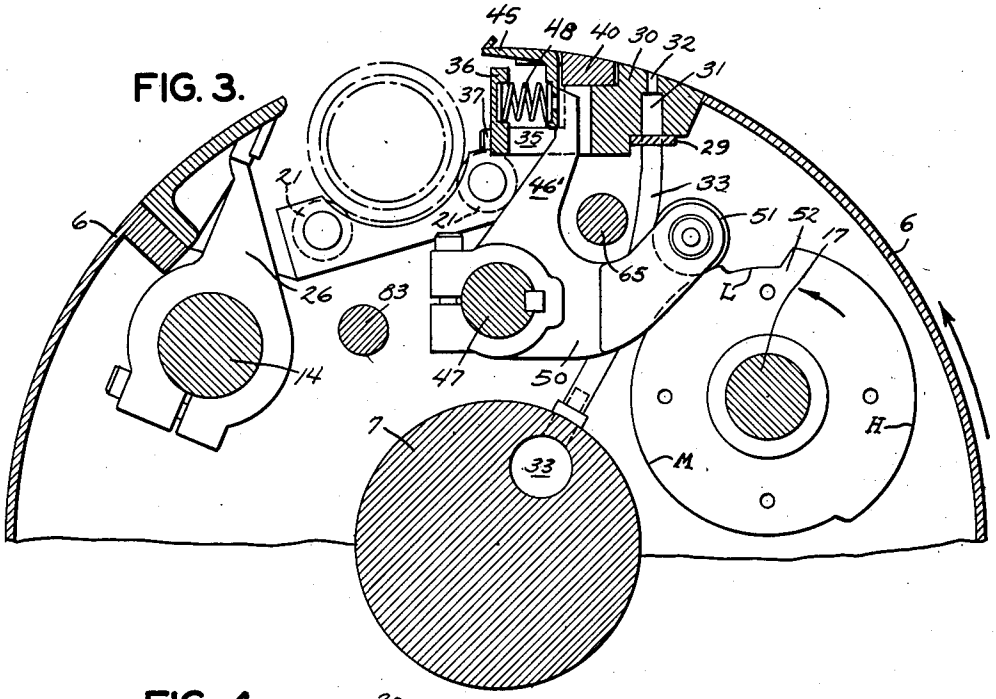
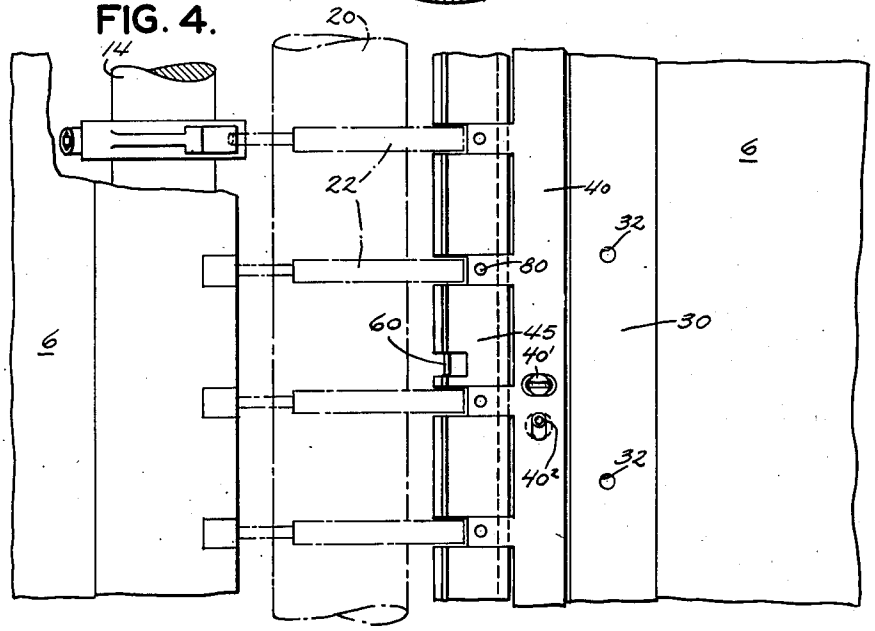


FIG. 4.



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SHEET REGISTERING MECHANISM

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FIG. 5.

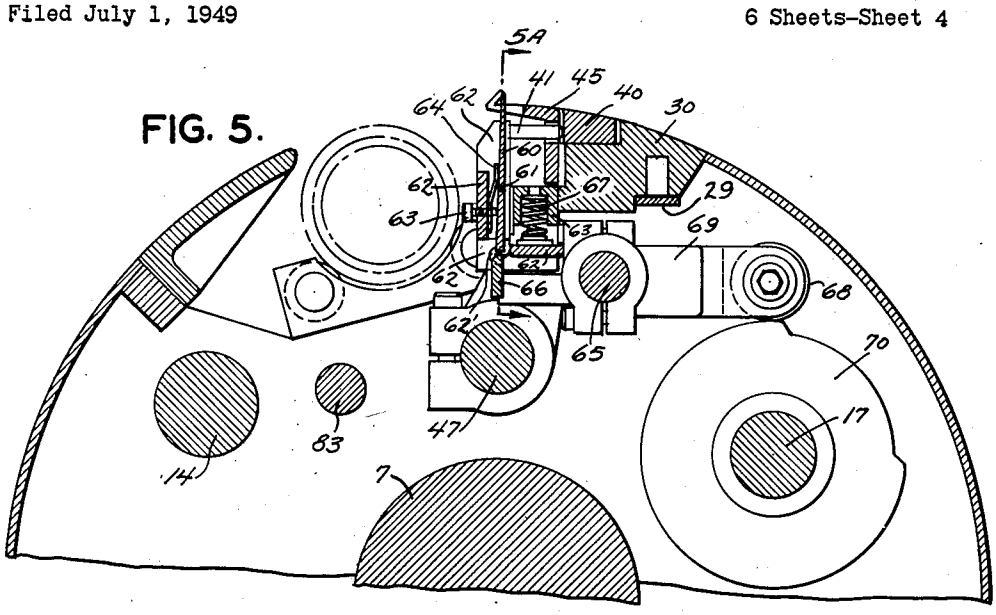


FIG. 6.

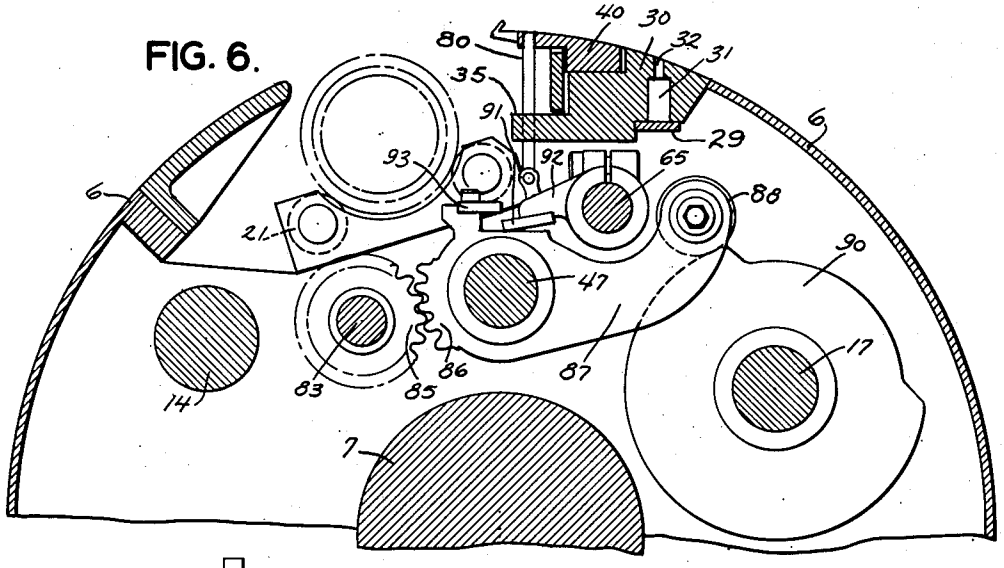
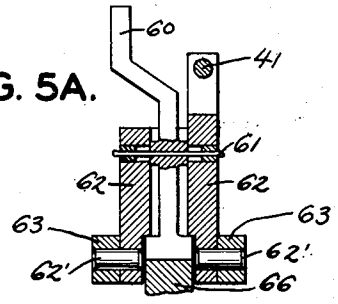


FIG. 5A.



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SHEET REGISTERING MECHANISM

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FIG. 7.

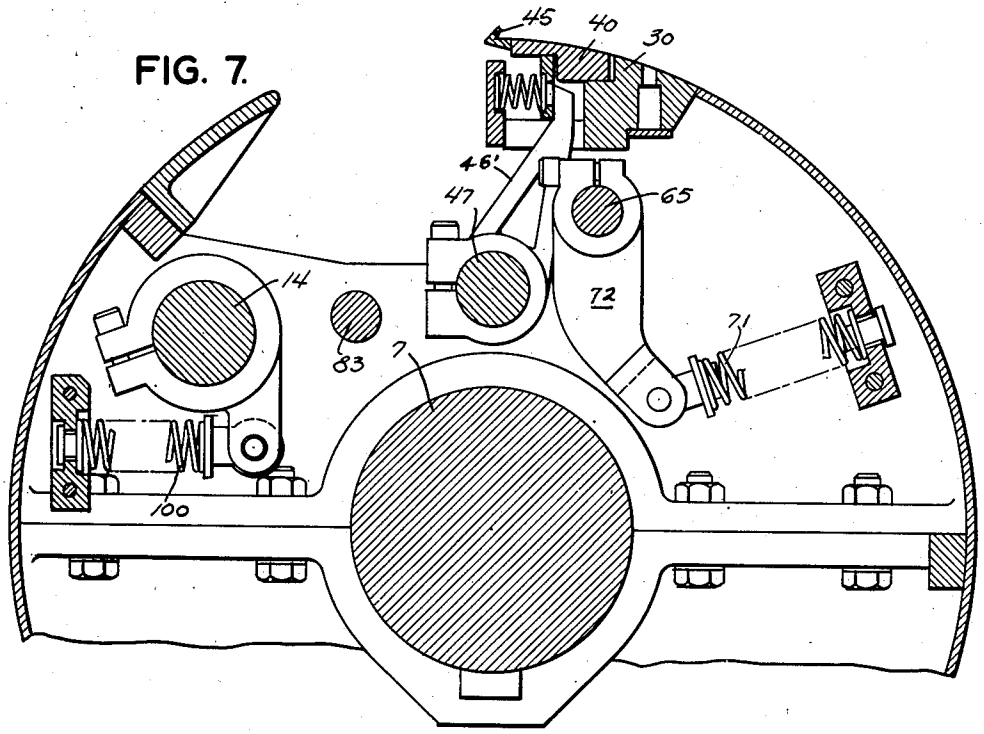
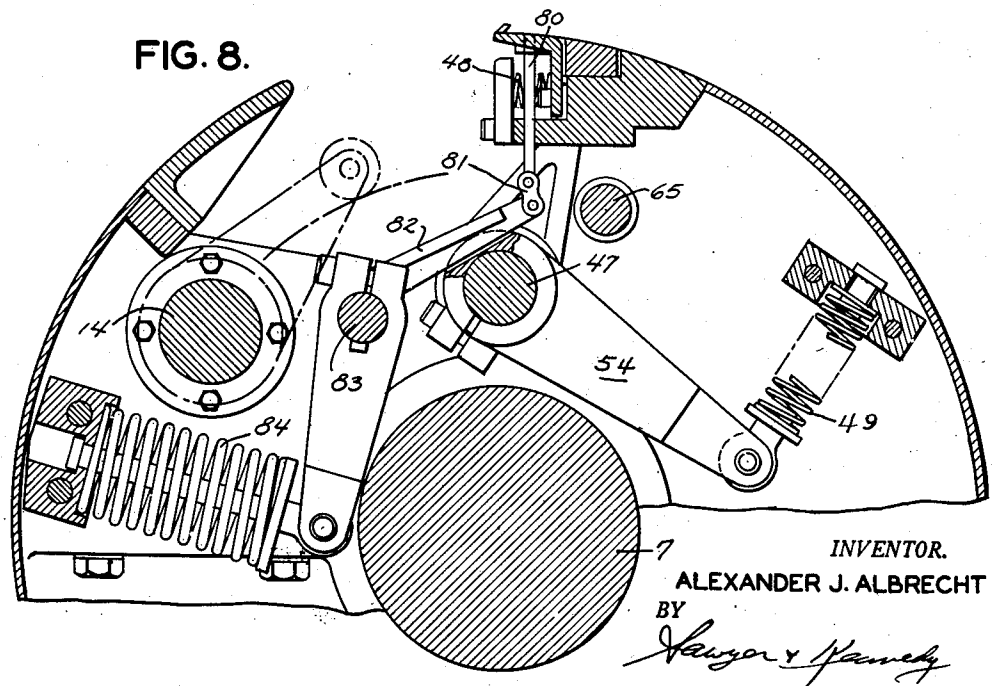


FIG. 8.



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SHEET REGISTERING MECHANISM

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FIG. 9.

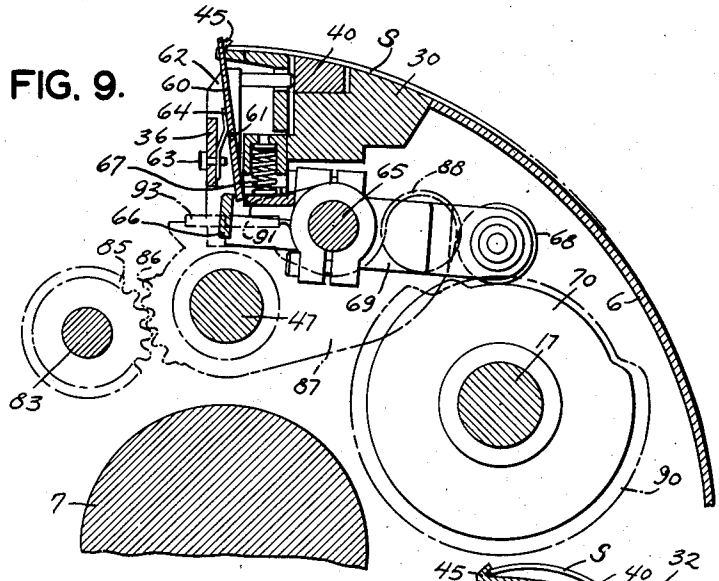


FIG. 10.

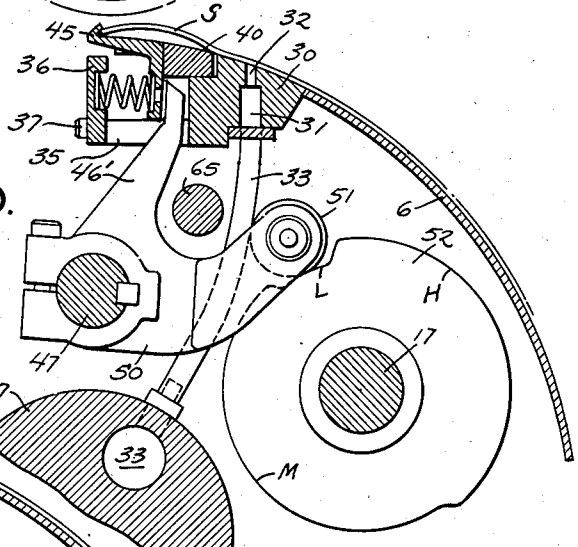
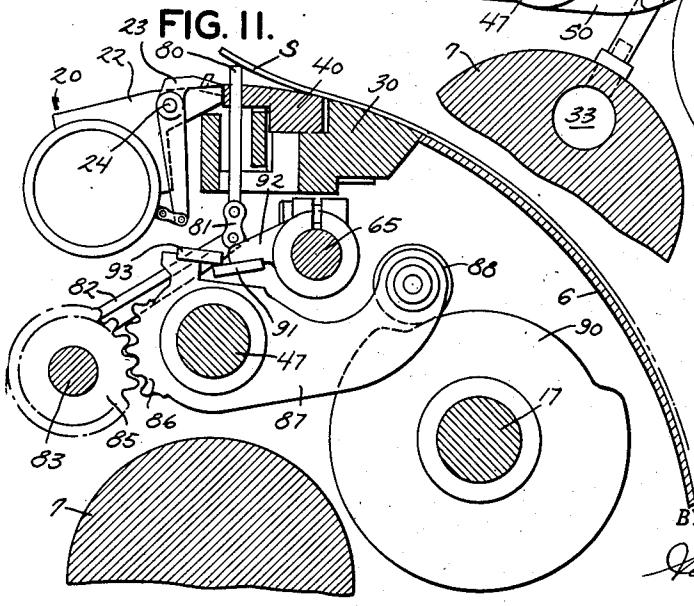


FIG. 11.



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Patented June 16, 1953

2,642,283

UNITED STATES PATENT OFFICE

2,642,283

SHEET REGISTERING MECHANISM

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Application July 1, 1949, Serial No. 102,682

12 Claims. (Cl. 271—53)

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This invention relates to improvements in sheet registering mechanism.

It is an object of the invention to provide an improved mechanism for rejecting sheets that are not properly registered.

Another object of the invention is to provide an improved detecting mechanism for determining whether a sheet is registered properly or not.

With the foregoing and still other objects which will appear in the following full description in mind, the invention consists in the combinations and arrangements of parts and details of construction which will now first be described with reference to the accompanying drawing and will then be more particularly pointed out in the appended claims.

In the drawings:

Figure 1 is a schematic plan view of a registering cylinder embodying the invention in a preferred form of embodiment;

Figures 2, 3, 5, 6, 7 and 8 are sections on the respective lines 2, 3, 5, 6, 7 and 8 of Figure 1, various parts appearing in certain of the views being omitted from others to show all the operating elements clearly;

Figure 4 is a plan view of a typical portion of the cylinder showing the elements cooperating with the leading edge of a sheet;

Figure 5-A is a detail section on the line 5-A of Figure 5; and

Figures 9, 10 and 11 are sectional views similar to Figures 2 and 5 to 8, illustrating the action of certain of the parts with relation to a sheet.

In Figure 1, the registering cylinder 1 is indicated generally in phantom, the internal disks or spiders 2, 3, 4 and 5 which support the outer shell 6 (not shown in Figure 1, but shown in other figures) and which also support the operating elements hereinafter described, being shown in full lines. The disks 2, 3, 4 and 5, are fixed to the cylinder shaft 7 which is carried in suitable bearings in the end housings 8 and 9. Details of construction not illustrated or described in detail in the present application are shown in Huck Patent No. 2,231,914, the present disclosure being confined to the novel elements forming the present invention and so much of the known structure as is necessary for a full understanding thereof.

As in the Huck patent referred to, sprocket wheels 10 and 11 are mounted on the cylinder shaft 7 for carrying a pair of sprocket chain conveyors for the sheets, which serve to position the gripper bars in the cylinder, for taking sheets as they are presented by a sheet feeding mechanism. The gripper mechanism is operated by means of a stationary cam 12 in a housing 9, upon which rides a cam roller on an arm 13 attached to a gripper operating shaft 14 journaled in the spiders 2, 3, 4 and 5. A stationary sun gear 15 (Figures 1 and 2) in a housing 8 meshes with a planet gear 16 fixed to a cam shaft 17, journaled in the spiders 2, 3 and 4. Gears 15 and 16 have a 1 to 1 ratio so that the shaft 17 makes two rotations with respect to stationary elements or one rotation with respect to the cylinder 1, for each rotation of the latter.

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The invention is shown as applied to a sheet registering device cooperating with gripper bars in tubular form, and having separably operable gripper elements actuated by a common actuating member, which is incorporated in the registering cylinder according to the disclosure of copending Albrecht application Serial No. 737,236 filed March 26, 1947. As in that application, the gripper bar 20 (Figures 2 and 4) is positioned within a recess in the cylinder by means of supporting rollers 21 (Figure 3), mounted on the disks or spiders 2, 3, 4 and 5. The gripper bar has a series of grippers spaced along it, each of which comprises a fixed lower jaw 22 (Figures 2 and 11), and a movable upper jaw 23 pivotally mounted at 24 and operated by means of a spring rod 25. Normally the springs will hold the jaws 22 and 23 closed for gripping a sheet of paper but the jaws are opened for receiving a sheet by means of a number of arms 26 fastened on the gripper operating shaft 14 previously referred to. Shaft 14 is oscillated by stationary cam 12 and cam follower 13 so as to open and close the gripper jaws at the appropriate times in the registering cycle.

A supporting bar 30 runs the length of the cylinder and has a grooved air passage 31 closed by a cover strip 29 (Figure 3) and communicating through suction holes 32 with a cylinder surface. Suction is applied to the passage 31 for holding a sheet down on the surface of a cylinder under control of a timing valve 53 (Figure 1), as hereinafter described. The support bar 30 has a number of projections 35 (Figures 6 and 10), to which are fastened plates 36 as by means of screws 37. An adjustable register bar 40 is fastened to the member 30 by means of a number of screws 40' (Figure 4), in transversely elongated slots and eccentric studs 40^2 in longitudinally elongated slots. These screws and slots permit the distortion or bowing of the bar 40 with reference to an axial element of the cylinder in the known manner and as more fully described in co-

pending Albrecht application Serial No. 102,681 filed July 1, 1949 for Front Stop Assembly. A front register stop member 45 (Figures 3 and 4) is carried by a series of arms 46 and 46', arranged in alternation on a shaft 47 journaled in the disks or spiders 2, etc., and extending the length of the cylinder. The arms 46 (Figure 2) are rotatable on the shaft 47 and secured to the stop member 45, while the arms 46' (Figure 7) are secured to the shaft 47 and bear against the member 45 except during the final movement of the stop member in registering a sheet. This front stop member 45 is successively positioned for stopping the leading edge of a sheet, then moved clockwise forcing the sheet edge backward to buckle it and position the sheet edge in proper register, and then advanced clear of the sheet when it is about to be taken by the grippers, as explained more fully hereinafter. Springs 48 acting between member 45 and plates 36 previously referred to, urge the member 45 toward the bar 30 and the arms 46', and hence tend to cause clockwise rotation of shaft 47 (Figure 3). The member 45 has sufficient flexibility to bow and conform to the adjustment of the register bar 40 when springs 48 are permitted to press it thereagainst. One of the arms 46' is formed with a member 50 (Figures 3 and 10), having a cam follower roller 51 which is biased toward a cam 52 on the cam shaft 17, by a spring 49 (Figure 8) connected to an arm 54 secured to the shaft 47. The cam 52 has high, low and medium sections indicated H, L and M respectively, these being arranged so that when a sheet being forwarded toward the cylinder to register the same is to be stopped, the roller will be on the medium section of the cam. Thereafter, while the roller 51 is on the low section of the cam, the sheet is forced backwardly and against the bar 40 (Figure 10), by the springs 48, its leading edge being buckled, and, as the high section of the cam comes under the roller, the stop member 45 will be advanced (counterclockwise in the figures) so as to clear it out of the way of the sheet as it is being taken away by the grippers. This cycle of movements is similar to that described fully in the copending Albrecht application for improvements in Front Stop Assembly hereinbefore mentioned.

A suction line 33 leads from the passage 31 through the cylinder shaft to a valve 53 (Figure 1), this valve, which in itself is of known type, serves to apply suction to the underside of the sheet immediately back of its leading edge just prior to and during its buckling, so as to prevent bodily movement of the sheet during the buckling at its front edge.

The detector mechanism (Figures 5 and 5-A) is in general similar to that disclosed in the herein mentioned "Front Stop Assembly" application. On machines that are used for printing sheets, the dimensions of which vary over a wide range, it is customary to provide sufficient detectors so that two may be selected which are so spaced that each engages the size of sheet to be printed, a short distance in from a side edge, and the other detectors are locked out of action. Each detector comprises a finger 60 which is pivoted at 61 in a frame 62 which in turn is pivoted at 62' in a frame 63 attached to the bar 30. Each frame 62 is urged clockwise about its pivot 62' by a spring 67 and carries a pin 41 extending through an aperture in the member 45, as indicated, and engaging the bar 40. Spring 67, forcing pin 41 against bar 40, thus maintains a fixed relation between the detector finger mounting and the register bar 40. The detector fingers 60 are adjustably stopped from clockwise rotation by screws 63 and are resiliently held against the screw by springs 64.

A detector shaft 65 journaled in the spiders 2, etc. carries blocks 66 adapted to engage the lower ends of the detector fingers 60 and is urged in the clockwise direction by a spring 71 (Figure 7), acting on an arm 72 secured to the shaft 65. A cam follower roller 68 (Figure 5) carried by an arm 69 fixed to the shaft 65, rides on a cam 70 carried by the cam shaft 17, so that the cam 70 and detector fingers 60 may control the movement of the detector shaft 65.

A detector finger in the position of Figure 5 will prevent movement of a block 66 and hence prevent rotation of detector shaft 65 when the low portion of the cam 70 is presented to the roller 68. This will cause rejection of the sheet.

The sheet ejecting mechanism comprises a plurality of ejector rods or plungers 80 (Figure 2) spaced along the cylinder and passing through apertures in member 40, each of these ejector rods 80 being connected through a link 81 to an arm 82 which is fixed to an ejector shaft 83. Shaft 83 is biased counterclockwise by a spring 84 (Figure 8). The movement of shaft 83 is controlled by means of a gear 85 (Figure 6) fixed to shaft 83 and meshing with a gear sector 86 loose on the shaft 47. The gear sector 86 is extended to form a cam follower arm 87 carrying a roller 88 which rides upon cam 90 mounted on the shaft 17. The spring 84 thus rotates shaft 83 counterclockwise (and shaft 47 clockwise) as the roller 88 passes to the low of the cam 90. Such rotation will push the rods 80 radially outward (Figure 11), thus pushing the sheet upward and away from the jaws 23 of the grippers, and preventing the grippers from taking the sheet. When a sheet is rejected, the rods 80 are retracted as soon as the high of cam 90 again comes under the roller 88, restoring the parts to the position of Figure 6.

In normal operation each sheet is presented with sufficient accuracy so that its leading edge engages both detector fingers 60, swinging them to the position shown in Figure 9, out of alignment with the block 66, and hence permitting clockwise movement of the detector shaft 65 as the roller 68 moves to the low portion of the cam 70 (Figure 9), and a toe 91 (Figure 6) carried on an arm 92 swings upward into alignment with an abutment 93 carried by the gear sector as shown in Figure 9. Any motion of the shaft 83 and the rods 80 to eject the sheet is thus prevented unless one of the detector fingers is not engaged by the sheet. Following the detecting action, when the cam 52 presents its low portion to the roller 51 (Figure 10), the shaft 47 with its arms 46 and 46' have moved the stop member 45 backward and against the register bar 40, buckling the sheet and presenting either a perfectly straight or slightly curved sheet edge to the grippers, depending upon the adjustment of the register bar 40. The grippers, which are operated as disclosed in application Serial Number 737,236 then close on the sheet and take it away from the registering cylinder.

The cycle of movement is illustrated in Figures 9, 10 and 11. Figure 9 represents the position of the parts at the time when the sheet S has been brought up against the stop 45, thus clearing the detector fingers 60 out of the way of the blocks 66, and the roller 68 being on the low part of cam 70, the detector shaft is rotated, bringing toe 91 into position to block movement of the abutment

93, and thus prevent rejection of the sheet. Figure 10 illustrates the position of the parts immediately thereafter, the roller 51 being on the low part of the cam 52, the front stop 45 being moved back against the register bar 40 and having buckled the leading edge of the sheet S as indicated. The suction through holes 32 would be applied just prior to this time. The grippers next take the sheet while it is buckled and just prior to the time when the gripper bar leaves the cylinder, valve 53 will cut off the suction, releasing the sheet.

If, however, a detector finger 60 is not moved by a sheet, and remains in the position of Figure 5, the shaft 65 can not rotate and is held in the same position after the low part of the cam 70 is under the roller 68. The roller 88 is then on the low cam 90 (Figure 11), and the ejector rods 80 will be protruded, preventing the grippers from taking the sheet. This action occurs at the time the bar 45 is moving to buckle the sheet, but instead the sheet is lifted free of the front stop 45 and above the grippers. When the suction through holes 32 is cut off by the operation of valve 53 the sheet, if rejected, will drop off and fall clear of the cylinder.

An arm 94 (Figure 2), secured to the shaft 83, is connected by means of a link 95 to a collar 96 rotatable on the gripper operating shaft 14 and carries a member 97 which engages a trip setting mechanism (not shown) that trips off the printing cylinders on the approach of a gripper bar from which a sheet has been rejected.

The gripper operating shaft controlled as before mentioned by stationary cam 12 is biased to force the cam follower roller 13 against this cam by means of a spring 100 as indicated in Figure 7.

The manner in which the various elements above described are interrelated and accommodated to each other is indicated in the sectional views already discussed and in Figure 4, the members 40 and 45 being formed to interfit as indicated and the latter having recesses or cut-outs for accommodating the detector fingers 60 and grippers 22 as shown. By reason of the operation of the sheet detector mechanism, sheet registering mechanism and sheet rejecting mechanism by separate cams upon the cam shaft 17 as above described, and the continuous drive of this shaft in one direction of rotation by means of the external gearing 15 and 16, it will be apparent that the operation of all elements with respect to one another and with respect to the rotation of the cylinder itself is synchronized and correlated very closely and in a very simple manner by merely attaching the cams to the cam shaft at proper angles to one another and to the planetary gearing.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, reference being made to the claims rather than to the foregoing description for an indication of the scope of the invention.

What is claimed is:

1. In a sheet handling mechanism, having a sheet support, means for registering a sheet thereon, and grippers for taking the registered sheet, the combination with the sheet support of detector mechanism for detecting an improperly registered sheet and sheet rejecting mechanism controlled thereby and comprising a plurality of sheet lifting elements spaced across the sheet support adjacent the grippers but spaced therefrom and operable to lift the edge of an improperly registered sheet up off the support so as to prevent its being taken by the grippers.

2. In a sheet handling mechanism, having a sheet support, means for registering a sheet thereon, and grippers for taking the registered sheet, the combination with the sheet support of detector mechanism for detecting an improperly registered sheet, a plurality of sheet rejecting plungers adjacent the grippers but spaced therefrom and movable in the sheet support to lift the edge of an improperly registered sheet up off the support so as to prevent its being taken by the grippers, and actuating mechanism controlled by the detector mechanism for operating the plungers.

3. In a sheet registering cylinder having means for advancing a sheet circumferentially to register it against a front stop, and in combination, a front stop, detector mechanism for detecting improperly registered sheets, cam mechanism operable by the rotation of the cylinder for operating a sheet gripper to take a sheet, a sheet rejector positioned in advance of the front stop, and cam mechanism operable by the rotation of the cylinder and controlled by the detector mechanism for operating the sheet rejector to lift the edge of an improperly registered sheet so as to prevent its being taken by the gripper.

4. A registering cylinder according to claim 3, in which the sheet rejector comprises a plurality of plungers protrudable from the cylinder for lifting the edge of the sheet.

5. In a sheet registering cylinder, having means for moving a sheet circumferentially of the cylinder against a front stop for registering the same, a front stop comprising a bendable front stop bar extending across the cylinder and comprising front stop means extending beyond the surface thereof, a bendably adjustable register bar extending across the cylinder adjacent the front stop bar in position to lie under a sheet engaged thereagainst, and means for urging the front stop bar yieldably against the register bar so as to bend the front stop bar to conform to the register bar for registering the leading edge of a sheet.

6. A registering cylinder according to claim 5, having also a detecting mechanism comprising a plurality of frames carrying pivotally mounted detector fingers and yieldably urged against the register bar in a position to engage a sheet which is against the front stop means, the front stop bar having recesses accommodating the said fingers and permitting movement thereof past the front stop means, and the register bar having projections also accommodated by the said recesses for engagement by the fingers.

7. In a sheet registering cylinder having means for advancing a sheet circumferentially to register it against a front stop, and in combination, front stop means, a bendably adjustable register bar, means for urging the front stop means yieldably against the register bar to conform to the bending thereof for registering the leading edge of a sheet, and detector mechanism comprising a plurality of movable frames carrying pivotally mounted detector fingers and yieldably urged against the register bar, the fingers being movable beyond the front stop means for detecting the absence of a properly registered sheet and being also arranged to be stopped by the edge of a sheet against the said front stop means.

8. A sheet registering cylinder according to claim 7, in which the frames are pivotally mounted and urged against the register bar by springs.

9. In a sheet registering cylinder having a sheet registering mechanism, a sheet detecting mechanism and a sheet rejecting mechanism, operating means for the said mechanisms comprising a cam shaft journaled in the cylinder, means for driving the cam shaft continuously and in one direction with relation to the cylinder, and a separate cam carried by the shaft for operating each of the respective mechanisms.

10. A sheet registering cylinder according to claim 9, in which the cam shaft drive means is arranged to rotate the cam shaft once with relation to the cylinder during each rotation of the latter.

11. A sheet registering cylinder according to claim 10, in which the cam shaft drive means comprises sun and planet gearing with one-to-one gear ratio.

12. In a sheet registering cylinder and in combination, a bendable front stop bar, a supporting shaft for said bar, a set of arms attached to the bar at intervals along its length and rotatably mounted on the shaft, a second set of arms also

spaced along the bar but fixed to the shaft and engaging the bar for forcing the same in one direction while permitting movement of the bar out of engagement, a set of springs engaging the bar at intervals along its length for forcing the same against the second set of arms, a bendably adjustable register bar positioned for engagement by the stop bar and forced thereagainst by the springs, and means for angularly moving the supporting shaft to force the front stop bar back against the pressure of the springs into a first registering position and to clear the second set of arms out of the way of the front stop bar to permit the springs to urge the same against the register bar in a second registering position.

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