

Oct. 16, 1956

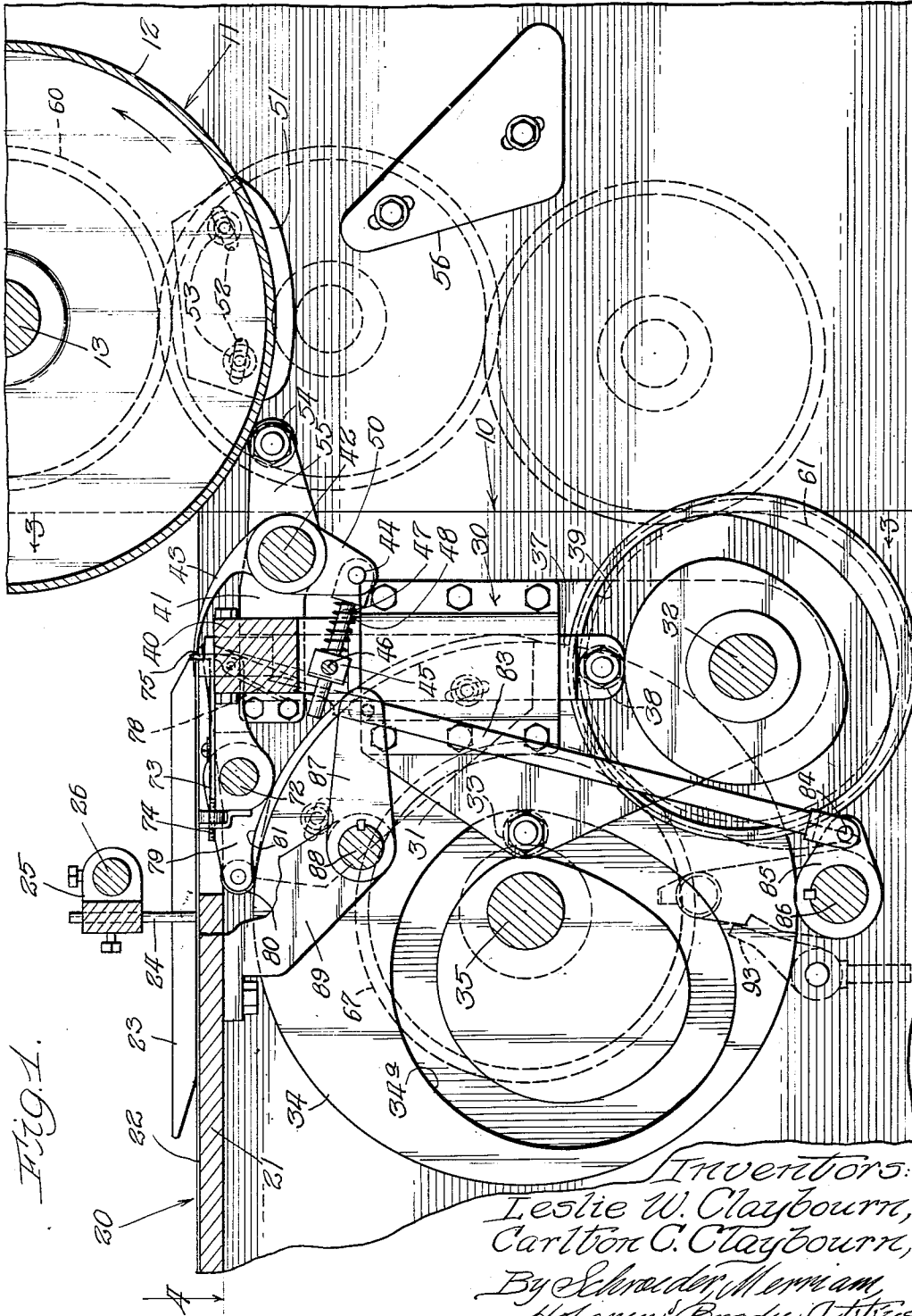
L. W. CLAYBOURN ET AL

2,766,985

SHEET TRANSFER MECHANISM

Filed May 28, 1952

5 Sheets-Sheet 1



Oct. 16, 1956

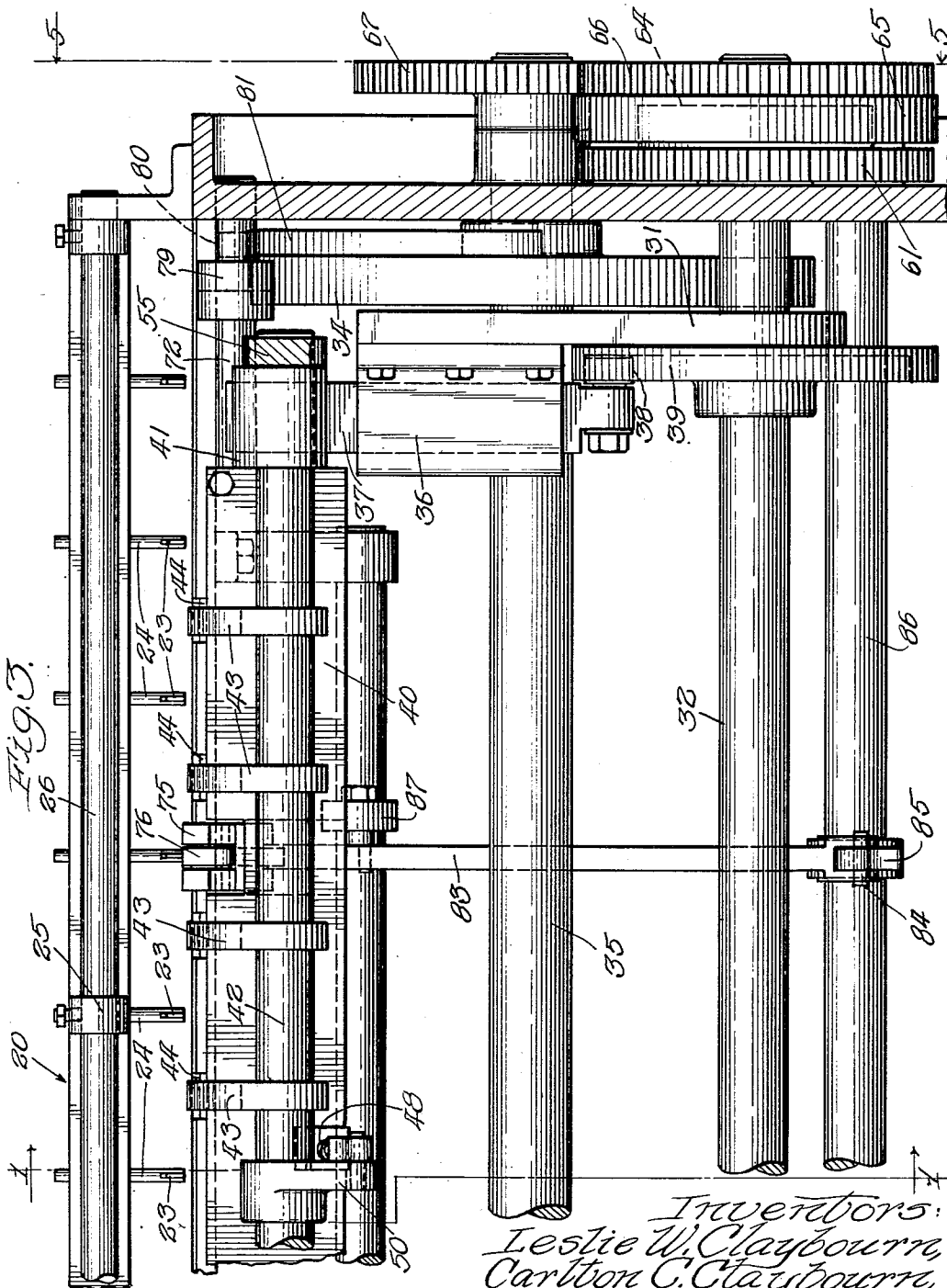
L. W. CLAYBOURN ET AL

2,766,985

SHEET TRANSFER MECHANISM

Filed May 28, 1952

5 Sheets-Sheet 3



Inventors:
Leslie W. Claybourn,
Carlton C. Claybourn,
By Schneider, Merriam,
Hofgren, Brady, Attys.

Oct. 16, 1956

L. W. CLAYBOURN ET AL.

2,766,985

SHEET TRANSFER MECHANISM

Filed May 28, 1952

5 Sheets-Sheet 4

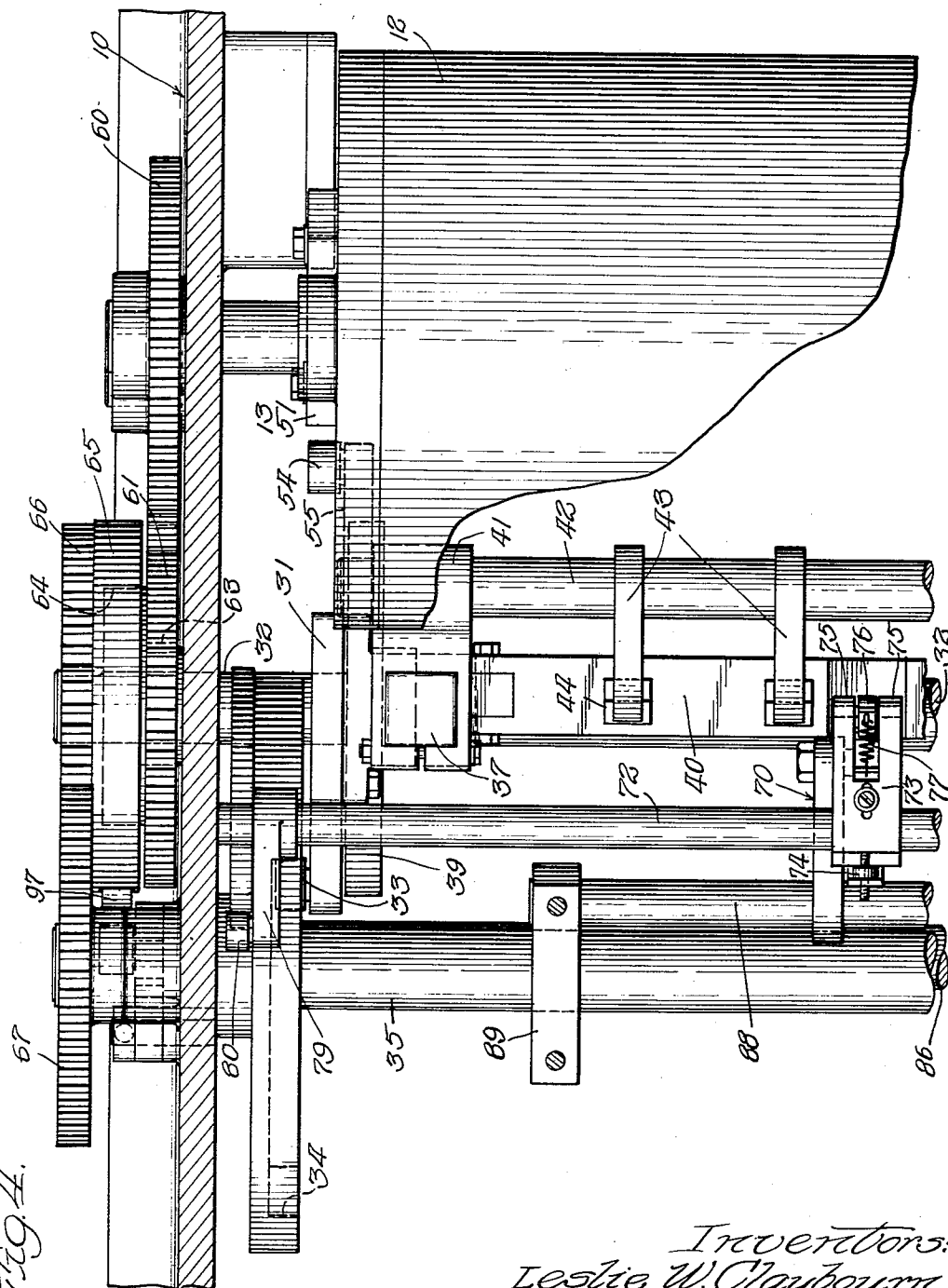


Fig. 4.

Inventors:
Leslie W. Claybourne,
Carlton C. Claybourne,
By Schroeder, Murrin,
Huggren & Brady, Attys.

Oct. 16, 1956

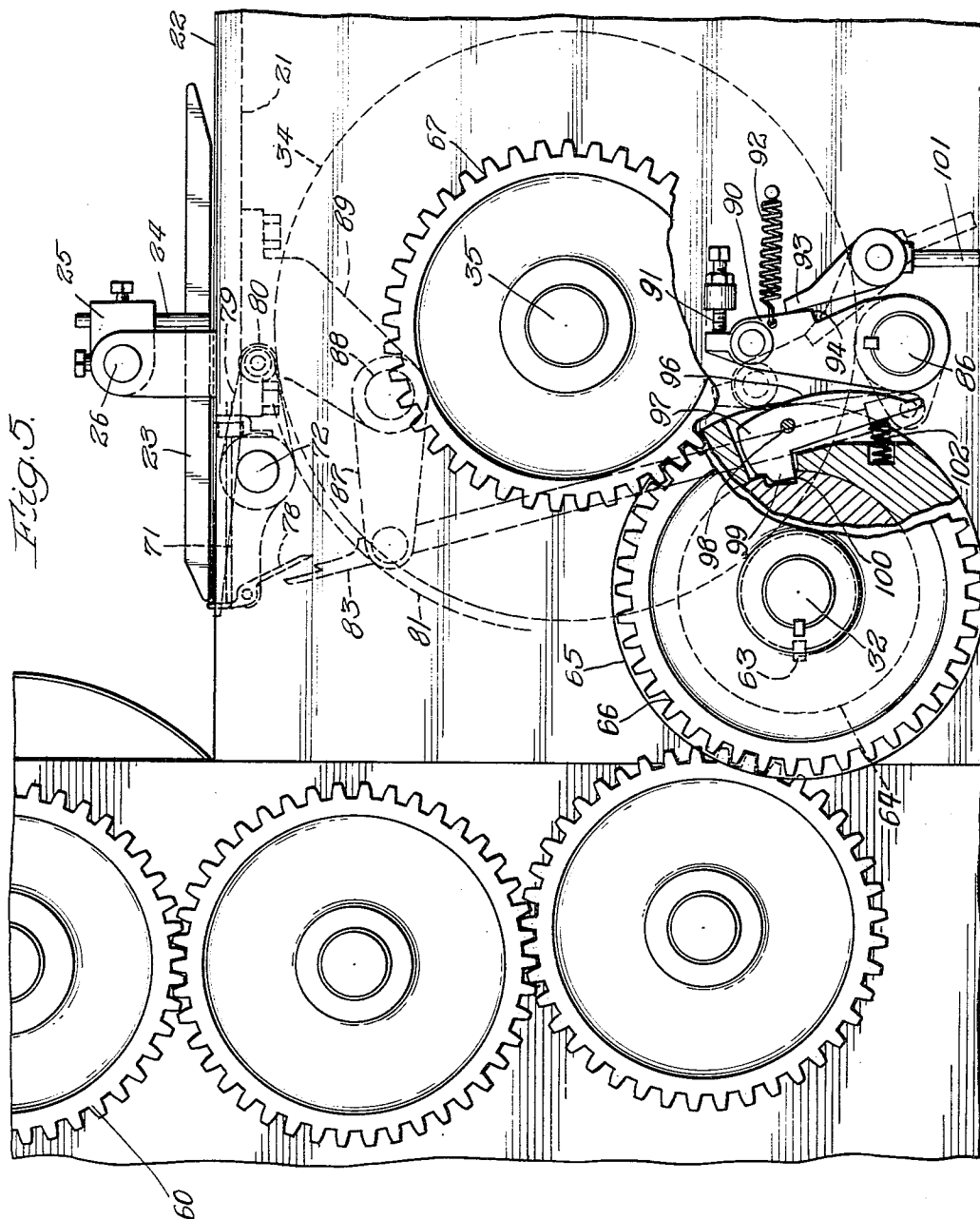
L. W. CLAYBOURN ET AL

2,766,985

SHEET TRANSFER MECHANISM

Filed May 28, 1952

5 Sheets-Sheet 5



Inventors:
Leslie W. Claybourn,
Carlton C. Claybourn,
By Schroeder, Merriam,
Hagman, Brady, & Coys.

1

2,766,985

SHEET TRANSFER MECHANISM

Leslie W. Claybourn and Carlton C. Claybourn,
Chicago, Ill.

Application May 28, 1952, Serial No. 290,496

10 Claims. (Cl. 271—51)

This invention relates to a transfer mechanism and more particularly to a mechanism for transferring flexible sheets such as paper or the like.

A number of machines are designed to handle sheet material such as paper and the like and require the incorporation of a mechanism to transfer a sheet from one part of the apparatus to another part. Where precision operations are being carried out on the sheet and thus where it is necessary continuously to maintain the sheet in proper alignment, the transfer mechanism must be so constructed and arranged as to effect the transfer without disturbing the alignment. It is the general object of this invention to produce a sheet transfer mechanism which is capable not only of effecting the transfer of sheet material without disturbing any previously determined alignment of the sheet, but also without damaging the sheet if it be formed of frangible material such as paper.

The requirements for a proper sheet transfer mechanism are particularly stringent when the device is used in conjunction with a printing press wherein the sheet material comprises sheets of paper. Many presses are so-called sheet fed presses and are provided with a feeder for rapidly feeding sheets singly and a feed-in mechanism for feeding sheets into the rolls of the press. Sheet transfer means must be provided between the feeder and the feed-in mechanism to effect the transfer of sheets therebetween. The majority of present printing presses are provided with a sheet transfer mechanism in the form of a roll or cylinder rotated at a constant speed and provided with gripping means for gripping a sheet in the feeder and through rotation of the cylinder transferring the sheet to the feed-in mechanism. Because of the fact that the feed-in cylinder is rotating relatively rapidly, the sheet is gripped "on the fly" and thus is accelerated from a stopped position adjacent the front guides of the feeder to press speed, or at least to the speed of the feed-in mechanism, substantially instantaneously. This not only places a tearing strain on the sheet at the points where it is engaged by the grippers on the transfer cylinder, but also is the cause of further damage to the sheets because of the fact that the grippers must snap down on the sheet very rapidly and thus are apt to crush the sheet at the gripped areas.

We have invented, and are herein disclosing and claiming, a sheet transfer mechanism capable of operating with the precision required in a printing press and yet one which eliminates the difficulties just discussed. To this end there is provided a sheet transfer mechanism which is oscillated or reciprocated in a path between the feeder and the feed-in mechanism which, because of such oscillatory movement, grips the sheet when the transfer mechanism is stopped or substantially stopped. Because of this feature two definite advantages result. One is that inasmuch as the grippers are operated when the transfer member which carries the grippers is substantially stationary, they may be operated more slowly and thus are not snapped on the sheet with sufficient force or rapidity to crush the paper. The second advantage is that the sheet is removed from

2

the feeder at a relatively gradually accelerated return so that tears which have resulted from the instantaneous acceleration previously mentioned are avoided.

The normal feeder for a printing press is provided with a detector mechanism for detecting a sheet advanced to the delivery point of the feeder in misaligned position, that is, a position wherein its leading edge is not precisely at right angles to the direction of movement of the sheet through the press. Such detector mechanisms are normally so arranged as to stop the press when a misaligned sheet reaches the delivery point of the feeder. Such stopping of the press prevents the misaligned sheet from passing thereto and it can then be manually straightened or removed and the operation of the press resumed. The principal disadvantage of detector mechanisms operating in the manner just discussed is that the sheets in the press and undergoing printing at the time the press is stopped are usually spoiled in that they become streaked or otherwise rendered unusable.

A further feature of the present invention is the provision of mechanism associated with the sheet transfer means which serves upon the detection of a misaligned sheet by the detector mechanism to stop only the sheet transfer means and thus allow the press to continue to run. Such a construction eliminates the wastage of spoiled sheets and yet quite effectively prevents the entry of a misaligned sheet into the printing part of the press.

Other and further features and advantages of the invention will be readily apparent from the following description and drawings, in which:

Fig. 1 is a vertical sectional view through a portion of a printing press embodying the invention and showing parts of the sheet feeder and the feed-in mechanism, the section being taken substantially along line 1—1 of Fig. 3;

Fig. 2 is a view like Fig. 1 with the apparatus in a different position;

Fig. 3 is a vertical section taken along line 3—3 of Fig. 1;

Fig. 4 is a top plan view of a portion of the apparatus shown in Fig. 1 with the feeder bed removed, the location of the section being indicated by the line 4—4 in Fig. 1; and

Fig. 5 is a view similar to Fig. 1 but taken on the opposite side of the press and with certain of the overlying parts removed to illustrate the construction of the clutch mechanism.

While this invention is susceptible of embodiments in many different forms, there is shown in the drawings and will herein be described in detail one specific embodiment, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

Referring now to Figs. 1—3, there is shown a portion 10 of the frame of a printing press which is provided with a feed-in mechanism 11 which in the present exemplary embodiment takes the form of a cylinder 12 mounted upon a driven shaft 13 and rotated continuously and at a substantially constant rate during the operation of the press. The purpose of the feed-in mechanism, as is well known in the art, is to receive sheets from the sheet transfer mechanism and feed them into the printing cylinders of the press. For this purpose the feed-in mechanism may take many forms including the extremely efficient feed-in mechanism shown in the copending application of L. W. Claybourn and C. C. Claybourn, filed March 27, 1952, as Serial No. 278,921, now Patent No. 2,699,333, issued January 11, 1955. The feed-in cylinder 12 is provided with sheet grippers 14 operated in the usual manner to be closed upon a sheet fed thereto by the sheet transfer

3

mechanism and operable to carry the sheet in predetermined aligned position into the press.

The press is also provided with a feeder 20 of usual construction which includes a table or bed 21 over which individual sheets 22 are fed to the delivery end of the feeder located at the right-hand end thereof as shown in Figs. 1 and 2. Sheet guides 23 overlie the table and rest against the upper surface of the sheets to hold them against buckle as they travel across the feeder bed with the guides being mounted on rods 24 adjustably held in brackets 25 mounted upon a cross rod 26 secured to suitable brackets on opposite sides of the feeder bed.

The sheet transfer mechanism of this invention is generally indicated at 30 and includes a substantially triangular carriage member 31 pivotally mounted upon a shaft 32 rotatably supported in the frame and provided with a cam follower 33 adjacent one of the apexes of the triangle, which follower rides in a box cam 34a provided on a rotatable cam wheel 34. The cam wheel is secured to a shaft 35 rotatably mounted in the frame with both the shafts 32 and 35 being driven by the means hereinafter described. The carriage 31 is provided with a bearing bracket 36 which slidably supports an arm 37 provided at its lower end with a cam follower 38 engaging a second cam 39 secured to the shaft 32. A cross bar 40 is secured to the upper end of the arm 37 and carries at its opposite ends a pair of arms 41 which rotatably support a sheet gripper shaft 42. A plurality of grippers 43 are secured to the shaft 42 with the grippers including pads 44 constituting the lower jaw against which the upper jaw of the grippers is moved to grip a sheet therebetween. Means are provided for constantly urging the grippers to closed position, that is, to a position wherein the upper jaw is pressed against the pad, such means including a square shaft 45 pivoted as indicated at 46 on the cross bar 40 and slidably supporting a rod 47 which extends through a suitable hole in the shaft 45. A spring 48 surrounds the rod and has one end bearing against the square shaft 45 and has its other end bearing against a bracket 49 pivotally secured to an arm 50 which in turn is secured to the shaft 42 and extends downwardly therefrom. The spring 48 is a compression spring and thus serves constantly to urge the shaft 42 toward rotation in a counterclockwise direction (as viewed in Fig. 1) to urge the jaw of the gripper against the pad.

Means are provided in the press for opening the grippers at suitable times so that they may be closed on a sheet positioned therebetween to grip the sheet and subsequently to release the sheet to the feed-in mechanism. For this purpose a cam 51 is adjustably secured to the feed-in cylinder 12 and to this end is provided with slots 52 through which bolts 53 extend with the bolts being threaded into the feed-in cylinder. The adjustment permits slight shifting movement of the cam 51 properly to synchronize its action with the operation of the press. The cam 51 is adapted to engage and operate a cam follower 54 secured to the end of an arm 55 in turn secured to the shaft 42. The operation of the parts thus far described are so synchronized as to cause the cam 51 to contact the cam follower 54 and hence to rotate the shaft 42 in a clockwise direction to open the grippers as the arm 37 which carries the grippers is in a position immediately adjacent the feeder 20 so that a sheet 22 therein is positioned between the upper jaws of the grippers and the pads therebeneath. In Fig. 1 the cam 51 has just accomplished this purpose and moved beyond the cam follower 54, thus permitting the spring 48 to close the grippers on the sheet 22. It will also be noted that at this time the cam follower 33 has reached substantially the innermost portion of the box cam 34a, that is, the portion closest to its axis of rotation, so that the arm 37 is substantially stopped. Thus no undue strain is pressed upon the sheet 22 as the upper jaw of the gripper is lowered thereagainst.

When the sheet transfer mechanism 30 is oscillated

4

to the position shown in Fig. 2, the grippers 43 must again be opened to release the sheet 22 to the grippers 14 carried on the feed-in cylinder 12. For this purpose there is provided a fixed cam 56 mounted on the frame and provided with an adjustable slot and bolt connection thereto for minor adjustments, which cam is adapted to contact the cam follower 54 as the arm 37 is oscillated to the position therein shown. Such contact between the cam 56 and the follower 54 serves again to open the grippers to release a sheet to the grippers 14 which are simultaneously closed.

To prevent the arm 37 and the mechanism carried thereby from interfering with the operation of the feed-in mechanism, means are provided for withdrawing the arm away from the feed-in cylinder after a sheet has been transferred thereto. An examination of Fig. 2 reveals that the cam follower 33 has almost reached the point in the cam 34a farthest from the axis of rotation of the cam and thus a slight additional oscillatory movement to the right of the arm will take place. It will also be noted that the cam follower 38 engages that portion of the cam 39 at the point farthest removed from the axis of rotation of that cam and additional rotation of the two cams 34a and 39 serves therefore not only to swing the arm slightly farther to the right but also to move the arm downwardly within its bracket 36 so as to withdraw the arm away from the feed-in cylinder.

The drive means for the mechanism described is best seen in Fig. 4 wherein the driven shaft 13 which carries the feed-in cylinder 12 is provided with a gear 60 fixed thereto which meshes through two intermediate gears to drive a gear 61 rotatably mounted on shaft 32. A plurality of pins 63 attach one element 64 of a clutch member to the gear 61. The other element 65 of the clutch member carries a gear 66 which meshes with another gear 67 fixed to the shaft 35 for rotating that shaft. Inasmuch as the gear 61 is rotatably mounted on the shaft 32, rotation of that gear does not serve to rotate the shaft 32 unless the clutch elements 64 and 65 are secured together by the means hereafter described whereupon rotation of the shaft 32 occurs and also rotation of the shaft 35 through the gears 66 and 67. Operation of the clutch and an automatic disengagement thereof to stop the operation of the sheet transfer mechanism is accomplished through the use of a detector mechanism 70 provided at the end of the feeder. As best seen in Figs. 2, 3 and 5, the detector mechanism includes a bracket 71 secured to a rotatably mounted shaft 72 and carries an upper plate 73 which is adjustably secured thereto through the provision of the adjusting screw and bolt 74. The outer ends of the plate 73 are provided with upturned spaced-apart fingers 75 constituting stops against which the sheet comes to rest at the delivery end of the feeder. Normally two such stops 75 are provided on each plate 73 and the normal installation calls for two such plates, one at each side of the feeder. A detector finger 76 having a lower end 78 is pivotally mounted between each pair of stops 75 and normally urged to a position where it extends inwardly or toward the direction from which the sheets are fed by a spring 77 (Figure 4). The spring is a very light hairspring which is extensible by edges of a sheet of paper as they come to rest against the stops 75. Such extension of the spring is accomplished by the pivoting of each of the detector fingers from the position shown in Fig. 2 to the position shown in Fig. 1. Both detector fingers are contacted by a sheet and are pivoted to the position shown in Fig. 1 only when the sheet is properly aligned in the feeder. To permit a properly aligned sheet to be released to the sheet transfer mechanism an arm 79 is secured to the shaft 72 and carries a cam follower 80 adapted to be contacted by a cam 81 adjustably mounted on the cam wheel 34 to rotate the shaft 72 clockwise from the position shown in Fig. 2 and thus to pivot the brackets 71 to move the stops carried

5

thereby out of blocking relationship to a sheet on the feeder.

In the event that a sheet is advanced to the delivery end of the feeder in misaligned position, its leading edge will fail to contact one or the other detector fingers 76 and thus fail to swing the lower end 78 thereof to the position shown in Fig. 1. Where the lower end is not so swung it remains in position to engage a notch 82 formed in a rod 83 which is pivotally connected at 84 at its lower end to a bracket 85 fixed to a clutch operating shaft 86. The upper end of the rod 83 is held in a pivoted bracket 87 rotatably mounted on a shaft 88 held in a bracket 89 fixed to the frame. An eccentric connection is provided between the guide arm 87 and the rod 83 as illustrated to provide for a slight adjustment in the positioning of the rod relative to the downwardly extending portion 78 of the detector finger.

With the downwardly extending portion 78 of the detector finger engaged in the notch 82 of the rod 83, resulting pivotal movement of the bracket 71 through the operation of the follower 80 and cam 81 serves to move the rod 83 downwardly and thus to rotate the shaft 86. Such rotation of the shaft serves to disengage the clutch members 64 and 65 previously described. To this end the shaft 86 carries a clutch operating arm 90 normally held against an adjustable stop 91 by the tension of a spring 92. Rotation of the shaft 86 clockwise (as shown in Fig. 5) permits a pawl 93 to drop by gravity into a notch 94 to hold the clutch actuating arm 90 in the position shown in the dotted lines in that figure wherein a cam follower 95 provided on the arm bears against a cam surface 96 provided on a clutch tooth member 97 pivotally mounted at 98 on the outer member 65 of the clutch. The member 97 carries a tooth 99 normally engaged with a suitable notch 100 formed in the other clutch member 64 so as to lock the two clutch members together to cause operation of the sheet transfer mechanism. With the arm 90 in the position shown in dotted lines in Fig. 5, however, the cam follower 95 causes rotation of the member 97 about its pivot to withdraw the tooth 97 from the notch 100 and thus to permit the clutch member 64 to rotate without causing rotation of its associated member 65. Thus the mechanism just described serves, upon the detection of a misaligned sheet, to stop only the operation of the sheet transfer mechanism without stopping the operation of the press. Thus the sheets within the press are not spoiled. After the misaligned sheet has been either removed or properly aligned in the feeder, the operation may be resumed by manually operating a lever 101 secured to the pawl 93 to remove it from engagement with the notch 94 in the arm 90, thus permitting the spring 92 to return the arm to the position shown in solid lines in Fig. 5 whereupon a compression spring 102 will pivot the member 97 back to the position shown therein wherein the tooth 99 engages the notch 100 to reinitiate operation of the sheet transfer mechanism.

We claim:

1. In combination with a feeder for delivering sheets and a feed-in mechanism for feeding sheets to a printing press, means for transferring sheets from the feeder to the feed-in mechanism comprising a pivotally mounted transfer member, sheet gripping means carried by the transfer member and movable between open and closed position, rotatable cam means including a rotatable cam and a cam follower on the transfer member for reciprocating the transfer member to position the gripping means alternately at a first position adjacent the feeder to grip a sheet therein and at a second position adjacent the feed-in mechanism to transfer a gripped sheet thereto, and movable cam means operable when the gripping means is at the first position for closing the gripping means on a sheet in the feeder and stationary cam means operable when the gripping means is at the second position to open the gripping means to release a gripped sheet to the feed-in mechanism.

6

2. In combination with a feeder for delivering sheets and a feed-in mechanism for feeding sheets to a printing press, means for transferring sheets from the feeder to the feed-in mechanism comprising a pivotally mounted transfer member, sheet gripping means carried by the transfer member and movable between open and closed position, movable cam means for reciprocating the transfer member to position the gripping means alternately at a first position adjacent the feeder and at a second position adjacent the feed-in mechanism, said means being adapted to maintain said transfer member and gripping means substantially stationary at said first position, means operable when the gripping means is at the first position for closing the gripping means on a sheet in the feeder and stationary cam means operable when the gripping means is at the second position for opening the gripping means to release a gripped sheet to the feed-in mechanism, detector means associated with the feeder for detecting a misaligned sheet therein, and clutch means operated by the detector means upon detection of a misaligned sheet for stopping the reciprocation of said transfer member.

3. In combination with a feeder for delivering sheets and a feed-in mechanism for feeding sheets to a printing press, means for transferring sheets from the feeder to the feed-in mechanism comprising a transfer mechanism including a movably mounted transfer member, sheet gripping means carried by the transfer member, means for moving the transfer member to position the gripping means alternately at a first position adjacent the feeder to grip a sheet therein and at a second position adjacent the feed-in mechanism to transfer a gripped sheet thereto, said means being adapted to maintain said transfer member and gripping means substantially stationary at said first position, a detector means associated with the feeder for detecting a misaligned sheet therein, and clutch means operated by the detector means upon detection of a misaligned sheet for stopping the operation of said transfer mechanism independently of the press.

4. In combination with a feeder for delivering sheets and a feed-in mechanism for feeding sheets to a printing press, means for transferring sheets from the feeder to the feed-in mechanism comprising a transfer arm, sheet gripping means carried by the transfer arm and movable between open and closed position, an oscillatably movable member supporting the transfer arm for sliding movement longitudinally of said member, first rotatable cam means driven in synchronism with the press for oscillating the member to position the gripping means on the arm alternately at a first position adjacent the feeder and at a second position adjacent the feed-in mechanism, said means being adapted to maintain said transfer member and gripping means substantially stationary at said first position, means operable when the gripping means is at the first position for closing the gripping means on a sheet in the feeder and stationary cam means operable when the gripping means is at the second position for opening the gripping means to release a gripped sheet to the feed-in mechanism, and second rotatable cam means driven in synchronism with the press and with said first rotatable cam means and operable when the gripping means are in said second position to move the arm longitudinally of said movable member and away from the feed-in mechanism.

5. In combination with a feeder for delivering sheets and a feed-in mechanism for feeding sheets to a printing press, means for transferring sheets from the feeder to the feed-in mechanism comprising a transfer arm, sheet gripping means carried by one end of the transfer arm and including a pair of jaws relatively movable between open and closed position, a pivotally movable member slidably supporting the transfer arm, a box cam rotated in synchronism with the press, said box cam being eccentric to configuration with respect to the axis of rotation thereof, a cam follower secured to the member and con-

7

tacting the box cam to oscillate the member to position the gripping means on the arm alternately at a first position wherein one of the jaws in said pair is positioned above and the other jaw is positioned below a sheet in the feeder, said follower being disposed in said box cam at a point immediately adjacent the axis of rotation of said box cam when said gripping means are at said first position and at a second position adjacent the feed-in mechanism, cam means operated when the gripping means is in said first position to close the jaws on a sheet therebetween, stationary cam means when the gripping means is oscillated to said second position to open the jaws to release a gripped sheet to the feed-in mechanism, and means for sliding the arm in said member and operable in synchronism with operation of the press to move the arm away from the feed-in mechanism when the gripping means is in said second position.

6. In combination with a feeder for delivering sheets and a feed-in mechanism for feeding sheets to a printing press, means for transferring sheets from the feeder to the feed-in mechanism comprising a gear train driven by the press, a transfer arm, sheet gripping means carried by one end of the transfer arm and including a pair of relatively movable jaws, a pivotally movable member slidably supporting the transfer arm, a first cam rotated by a gear in said train, a first cam follower secured to the member and contacting the cam to oscillate the member to position the gripping means on the arm alternately at a first position wherein one of the jaws in said pair is positioned above and the other jaw is positioned below a sheet in the feeder and at a second position adjacent the feed-in mechanism, a second cam follower connected to the jaws for moving the same between closed and open position, a second cam rotated by another gear in said train and adapted to contact the second cam follower when the gripping means is in said first position to close the jaws on a sheet therebetween, a third cam positioned to contact the second cam follower when the member is oscillated to position said gripping means at the second position to open the jaws to release a gripped sheet to the feed-in mechanism, a third cam follower secured to the other end of the transfer arm, and a fourth cam rotated by said gear train and contacting the third cam follower to move the arm longitudinally of the pivotally movable member and away from the feed-in mechanism when the arm is in said second position.

7. In combination with a feeder for delivering sheets and a feed-in mechanism for feeding sheets to a printing press, means for transferring sheets from the feeder to the feed-in mechanism comprising a gear train driven by the press, a transfer arm, sheet gripping means carried by one end of the transfer arm and including a pair of relatively movable jaws, a pivotally movable member slidably supporting the transfer arm, a first cam rotated by a gear in said train, said first cam having a cam path eccentric about the axis of rotation thereof, a clutch operable to disengage said gear from the train, a first cam follower secured to the member and contacting the first cam to oscillate the member to position the gripping means on the arm alternately at a first position wherein one of the jaws in said pair is positioned above and the other jaw is positioned below a sheet in the feeder said cam follower being at a point on the said first cam immediately adjacent the axis of rotation thereof when said grippers are at said first position and at a second position adjacent the feed-in mechanism, a second cam fol-

8

lower connected to the jaws for moving the same between closed and open position, a second cam rotated by another gear in said train and adapted to contact the second cam follower when the gripping means is in said first position to close the jaws on a sheet therebetween, a third cam positioned to contact the second cam follower when the arm is oscillated to position said gripping means at the second position to open the jaws to release a gripped sheet to the feed-in mechanism, a third cam follower secured to the other end of the transfer arm, a fourth cam rotated by said gear train and contacting the third cam follower to move the arm away from the feed-in mechanism when the arm is in said second position, detector means associated with the feeder for detecting a misaligned sheet therein, and means operated by the detector means upon detection of a misaligned sheet to disengage the clutch.

8. Sheet transferring means as specified in claim 4 wherein the arm supporting said sheet grippers is provided with a cam follower at the end thereof opposite said grippers and the second rotatable cam means is mounted on the axis about which the movable member oscillates so as to engage said cam follower and effect movement of said arm longitudinally of said member.

9. Sheet transfer means as specified in claim 8 wherein said detector means comprises a detector arm pivotally mounted on a rockable stop member, said detector arm having a portion aligned with a clutch disengaging arm, said portion being pivoted out of alignment with said clutch disengaging arm by a sheet properly aligned against said stop member.

10. In combination with a feeder for delivering sheets and a feed-in mechanism for feeding sheets to a printing press, means for transferring sheets from the feeder to the feed-in mechanism comprising a pivotally mounted transfer member, sheet gripping means carried by the transfer member and movable between open and closed positions, means for reciprocating the transfer member including a rotatable cam wheel, a box cam formed in said cam wheel, said box cam forming a closed camway eccentric about the axis of rotation of said cam wheel, a cam follower on said transfer member adapted to traverse said box cam whereby to position the gripping means alternately at a first position adjacent the feeder to grip a sheet therein and at a second position adjacent the feed-in mechanism to transfer a gripped sheet thereto, and movable cam means operable when the gripping means is at the first position for closing the gripping means on a sheet in the feeder and stationary cam means when the gripping means is at the second position to open the gripping means to release a gripped sheet to the feed-in mechanism.

References Cited in the file of this patent

UNITED STATES PATENTS

1,790,457	Blaine	Jan. 27, 1931
2,128,317	Peyrebrune	Aug. 30, 1938
2,154,022	Backhouse	Apr. 11, 1939
2,235,844	Nelson	Mar. 25, 1941
2,317,993	Harrold	May 4, 1943
2,474,150	Jacobson	June 21, 1949
2,499,125	Backhouse	Feb. 28, 1950
2,579,406	Tebbs	Dec. 18, 1951
2,618,479	Peyrebrune	Nov. 18, 1952