May 12, 1953 H. J. LUEHRS 2,638,342

SHEET FEEDING AND REGISTERING MECHANISM

Filed April 4, 1951 6 Sheets-Sheet 1

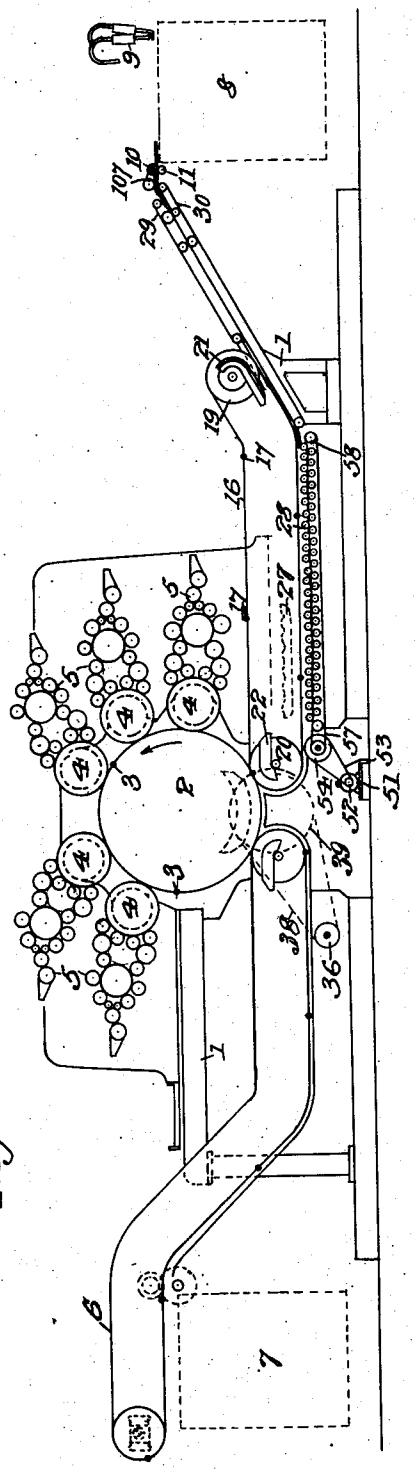


Fig. 1.

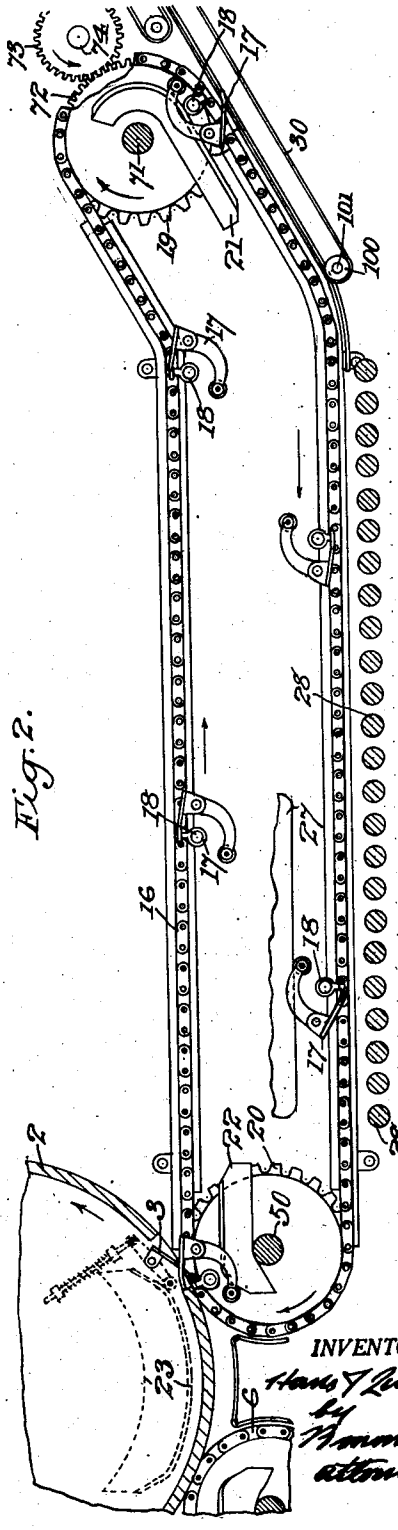


Fig. 2.

INVENTOR.
Harry J. Luehrs
by Fennemore Craig
attorneys

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SHEET FEEDING AND REGISTERING MECHANISM

Filed April 4, 1951 6 Sheets-Sheet 2

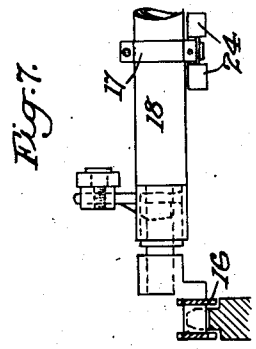


Fig. 7.

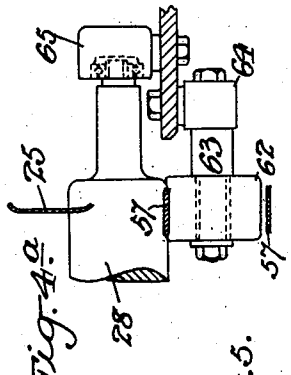


Fig. 4a.

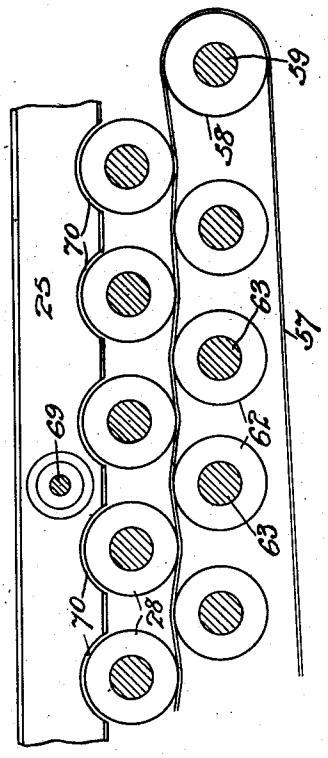


Fig. 5.

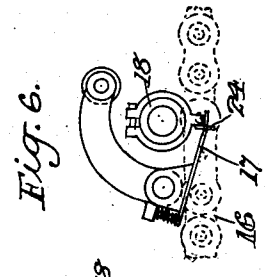


Fig. 6.

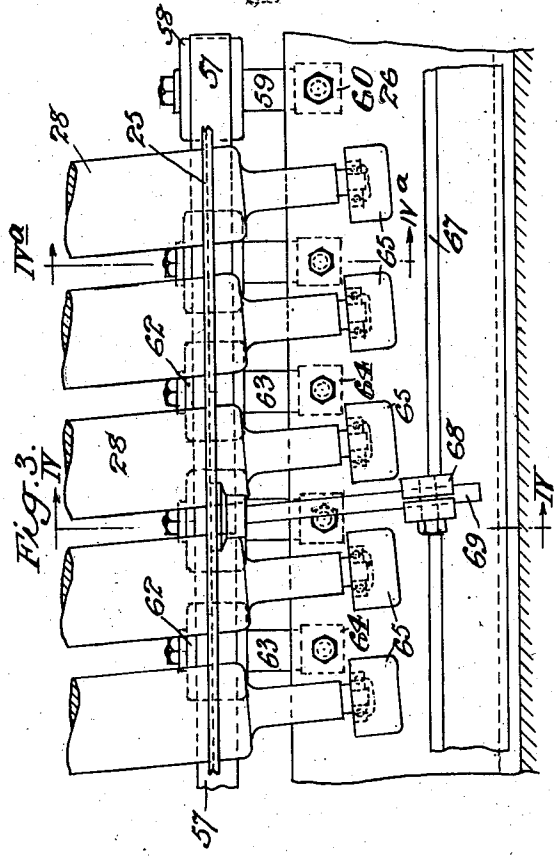


Fig. 3.

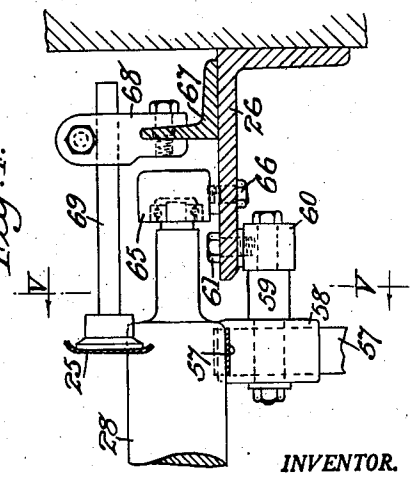


Fig. 4.

INVENTOR.

Harold J. Luehrs

BY

Brown & Howard

attorneys

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SHEET FEEDING AND REGISTERING MECHANISM

Filed April 4, 1951 6 Sheets-Sheet 3

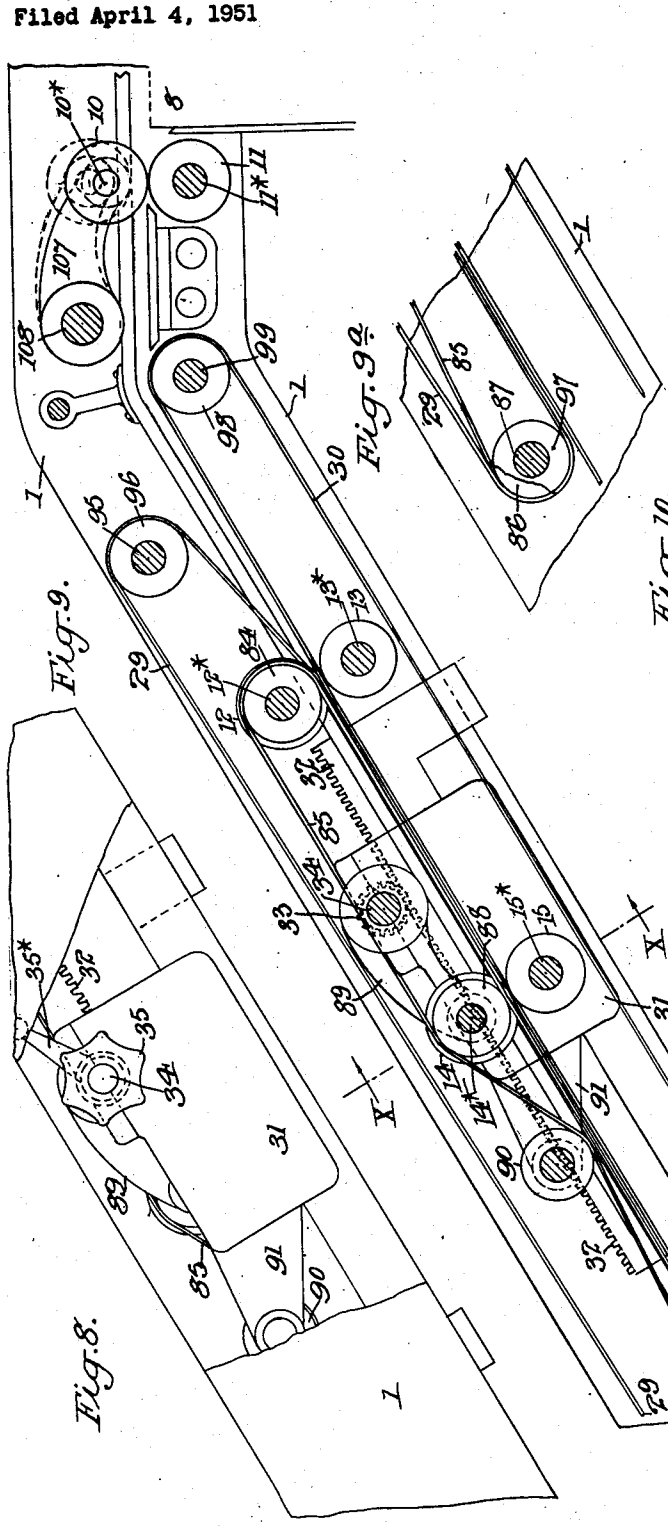


Fig. 8.

Fig. 9.

Fig. 9a.

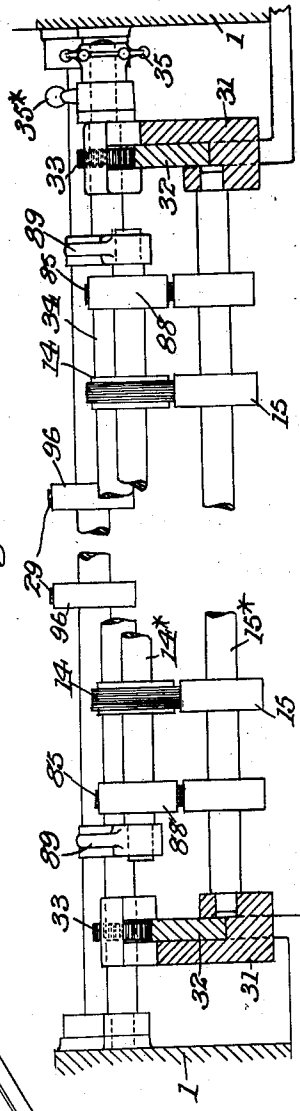


Fig. 10.

INVENTOR.
Hans J. Luehrs
BY
Thomas Durand
attorneys

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SHEET FEEDING AND REGISTERING MECHANISM

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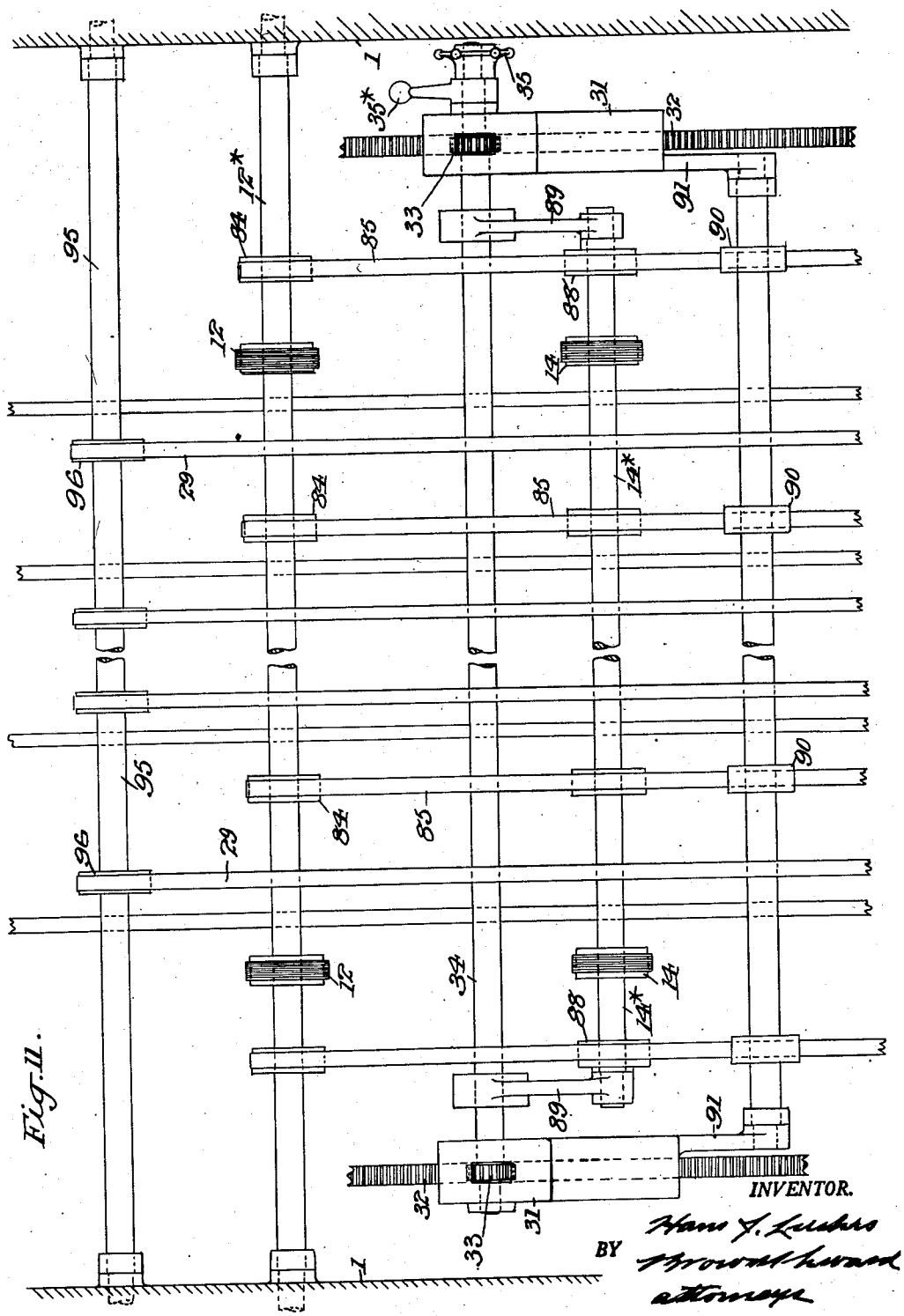


Fig. 11.

INVENTOR.

BY Hans J. Luehrs
Prowell Howard
attorneys

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SHEET FEEDING AND REGISTERING MECHANISM

Filed April 4, 1951 6 Sheets-Sheet 5

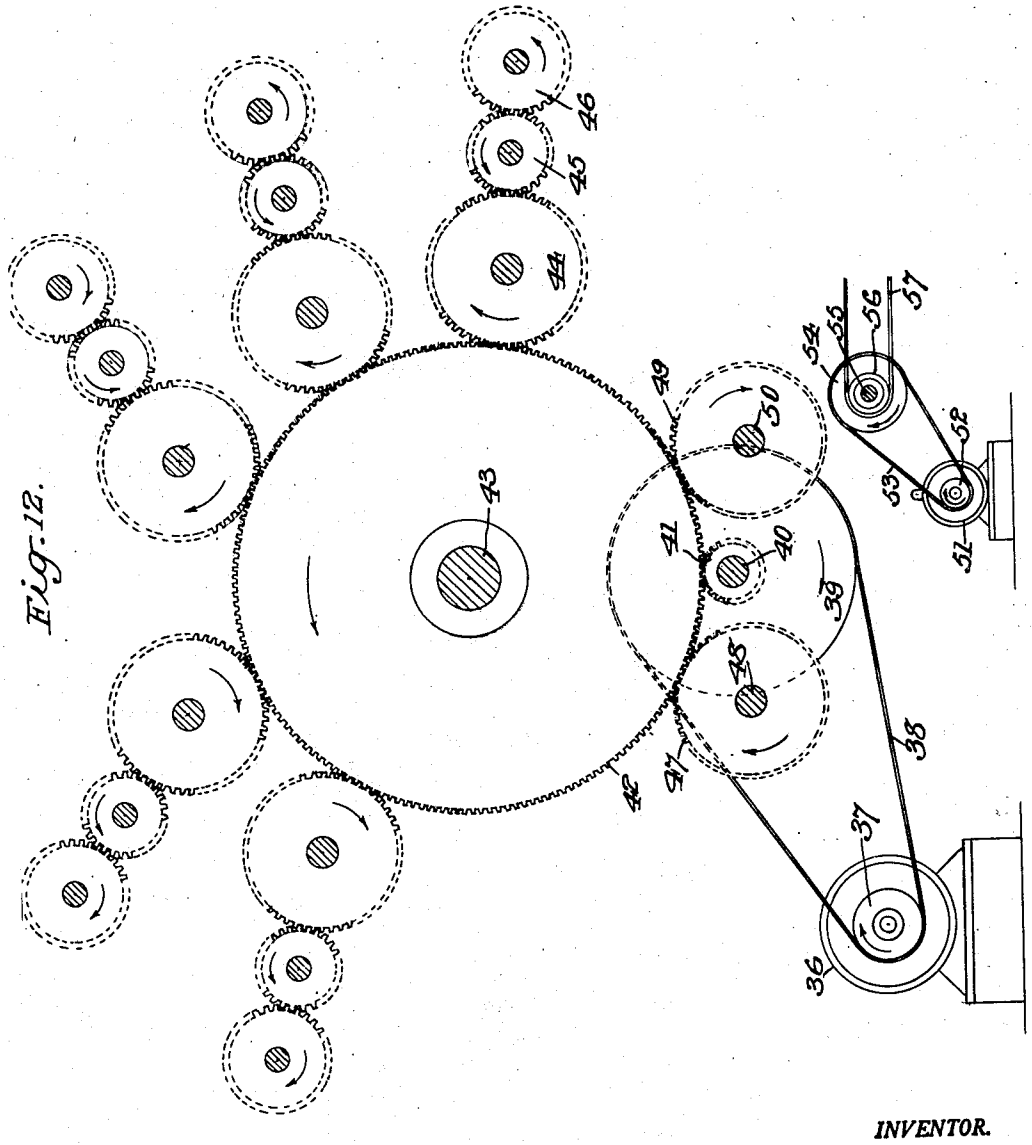


Fig. 12.

INVENTOR.

Harry J. Luehrs

BY

Brown & Brown

attorneys

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SHEET FEEDING AND REGISTERING MECHANISM

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Fig. 13.

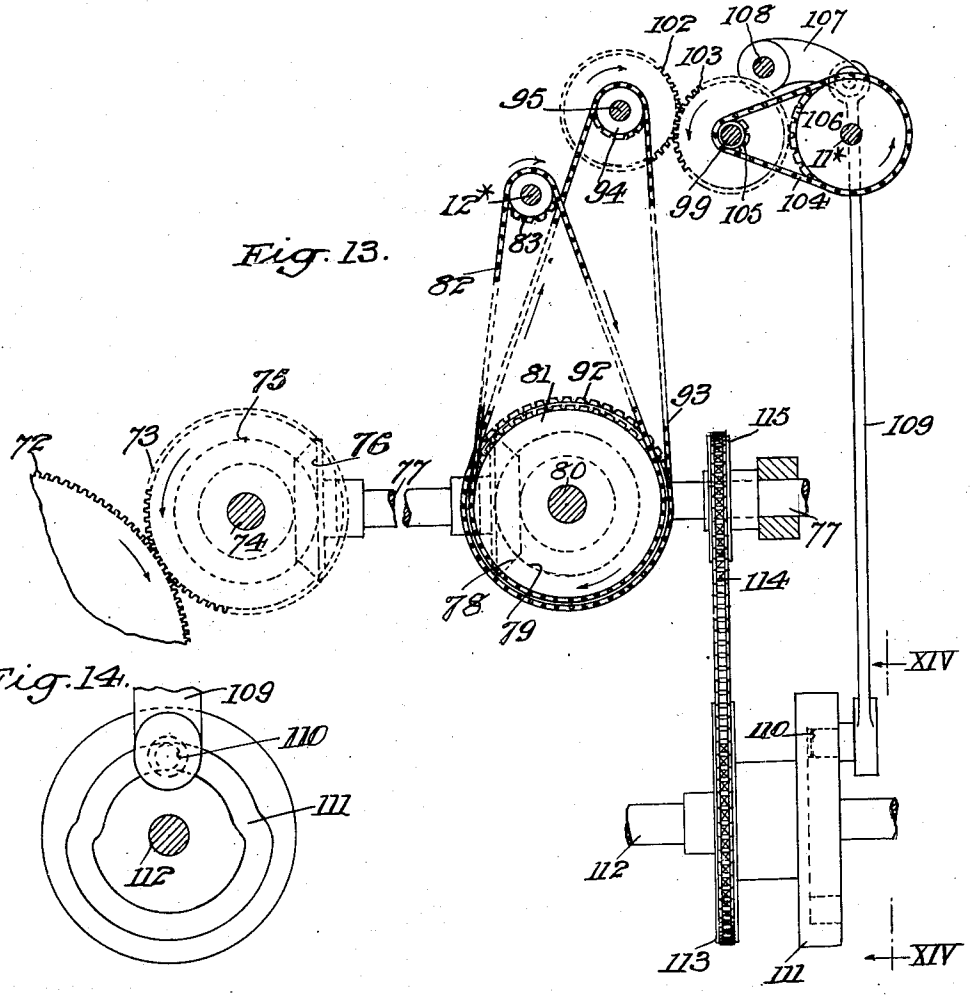


Fig. 14.

INVENTOR.
Hans J. Luehrs
BY Brumbaugh
attorneys

Patented May 12, 1953 2,638,342

UNITED STATES PATENT OFFICE

2,638,342

SHEET FEEDING AND REGISTERING MECHANISM

Hans J. Luehrs, Westerly, R. I., assignor to C. B. Cottrell & Sons Company, Westerly, R. I., a corporation of Delaware

Application April 4, 1951, Serial No. 219,198

26 Claims. (Cl. 271—48)

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This invention is directed to a novel sheet feeding and registering mechanism, especially applicable for use in connection with rotary printing presses, wherein the sheets may be front and side registered without delaying or stopping the sheets as they are being fed from their source of supply to their registered sheet receiving element.

One object of this invention is to provide a novel, simple and effective sheet feeding and registering mechanism, which includes a suitable registered sheet receiving element as, for instance, an impression cylinder of a rotary printing press; an endless carrier for feeding the sheets to the said sheet receiving element; means being provided for temporarily releasing the sheets from the endless carrier before they reach the sheet receiving element; and means also being provided for front and side registering the temporarily released traveling sheets before they are again taken by the endless carrier to be fed thereby to the said sheet receiving element.

A further object is to provide a novel means whereby the sheet receiving element and the endless carrier may be driven at substantially the same surface speed and the sheet front and side registering means may be driven at a higher surface speed.

A further object is to provide a minimum number of coacting sheet forwarding devices driven at different surface speeds for positively feeding the sheets as rapidly as possible from the source of sheet supply to the sheet receiving element and feeding the sheets to the said element at the surface speed thereof.

A further object is to eliminate from the sheet feeding and registering mechanism all reciprocating and intermittent movements so that the feeding rate of the registered sheets to the sheet receiving element may be materiallly increased without subjecting either the feeding and registering mechanism or the sheets to excessive strains.

This invention includes a sheet registering means which comprises a row of angularly positioned sheet support rollers for imparting a combined forward and lateral additional movement to the temporarily released traveling sheets to front and side register the sheets without delaying or stopping the sheets in their travel to the sheet receiving element.

This invention also includes first and second pairs of coacting friction rollers for feeding the sheets positively to the endless carrier; the second pairs of coacting friction rollers being adjustable toward and away from the endless carrier to feed sheets of different lengths thereto.

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This invention also includes upper and lower coacting sheet combing belts for guiding the sheets from the friction rollers to the endless carrier.

This invention also includes pairs of pinch rollers for positively feeding successive sheets to the friction rollers, said sheets being fed from the source of sheet supply to the pinch rollers by any well known or approved means.

This invention also includes means for driving the sheet receiving cylinder, the endless carrier and the pairs of friction rollers at substantially the same surface speed, the pinch rollers at a slower surface speed, and the angularly positioned sheet registering rollers and the combing belts at higher surface speeds than the sheet receiving cylinder.

A practical embodiment of this invention is represented in the accompanying drawings.

Fig. 1 represents, in diagram, a side elevation of a sheet fed multi-color rotary printing press, which includes the sheet feeding and registering mechanism which forms the subject matter of this invention.

Fig. 2 represents, on an enlarged scale, a longitudinal central section through the sheet feeding endless carrier, the sheet registering means and a portion of the impression cylinder of the printing press.

Fig. 3 represents a detail top plan view of a portion of the sheet registering means.

Fig. 4 represents a detail vertical cross-section through the sheet registering means on line IV—IV of Fig. 3, with the friction belt supporting rollers omitted.

Fig. 4*a* represents a detail vertical cross-section through the sheet registering means on line IV*a*—IV*a* of Fig. 3.

Fig. 5 represents a detail longitudinal vertical section on line V—V of Fig. 4.

Fig. 6 represents a detail side view of one of the endless carrier sheet grippers and the front registering device carried by the gripper cross-bar.

Fig. 7 represents a detail front view of the same.

Fig. 8 represents a detail side view of the manually operated means for adjusting the second pairs of sheet feeding friction rollers.

Fig. 9 represents a longitudinal vertical section showing the sheet feeding pinch rollers, the pairs of friction rollers, the sheet combing belts

and the adjusting means for the second pairs of friction rollers.

Fig. 9a represents a similar section showing the belt pulleys which are located adjacent the sheet receiving end of the endless chain carrier.

Fig. 10 represents a vertical cross-section at line X—X of Fig. 9.

Fig. 11 represents a detail plan view of the friction rollers, the combing belts and the adjusting means for the second pairs of friction rollers.

Fig. 12 represents a detail vertical section showing portions of the drives for the printing unit, the sheet feeding and registering mechanism and the delivery mechanism.

Fig. 13 represents a detail vertical section showing the drive for the combing belts, and the drive and operating means for the pinch rollers.

Fig. 14 represents a detail vertical section on line XIV—XIV of Fig. 13.

A printing press frame 1 may be of any desired form and construction suitable for mounting the various mechanisms to be hereinafter described.

The multi-color printing unit is herein shown as including the impression cylinder 2, provided with one or more sets of grippers 3; and the form cylinders 4 which are arranged around the impression cylinder 2. Inking mechanisms 5 are shown for the various form cylinders. The impression cylinder may be driven at a selected surface speed.

The delivery mechanism, which forms no part of the present invention, may be of any well known or approved construction. It is shown herein as including an endless carrier 6 for receiving the printed sheets from the impression cylinder 2 and conveying them to a sheet delivery point, as a pile 7.

The sheet feeding and registering mechanism is shown as including the following elements: The source of sheet supply is herein shown as a pile 8. A device 9 is provided for feeding successive sheets from the pile 8, which device may be of any well known or approved construction.

Pairs of upper and lower coacting pinch rollers 10 and 11 are mounted on cross shafts 10* and 11*, which rollers are driven at a considerably lower surface speed than the impression cylinder 2, coact to take the sheets from the device 9 and feed them to first and second pairs of upper and lower friction rollers 12, 13 and 14, 15 mounted on cross shafts 12*, 13* and 14*, 15*; which friction rollers are driven at substantially the same surface speed as the impression cylinder 2.

An endless chain carrier 16 is positioned to take the sheets fed from the pairs of friction rollers, which endless carrier is driven at substantially the surface speed of the impression cylinder 2 and friction rollers. This endless carrier 16 is provided with spaced sets of head grippers 17 carried by cross-bars 18 mounted on the side chains of the endless carrier 16. These side chains pass around sprocket wheels 19 at the sheet receiving end of the endless carrier 16 and also around sprocket wheels 20 at the sheet transfer end of the endless carrier adjacent the impression cylinder 2.

A fixed cam 21 serves to open the endless carrier grippers 17 when they arrive at the sheet receiving end of the endless carrier 16 in position to take the sheets fed thereto by the pairs of friction rollers 12, 13 and 14, 15. Another fixed cam 22 serves to open the endless carrier grippers 17 when they arrive at the sheet transfer end of the endless carrier in position to be transferred to the impression cylinder grippers 3. A fixed cam 23 serves to open the impression cylinder grippers 3 in time to take the registered sheets from the endless carrier grippers 17; which cam 23 also opens the impression cylinder grippers 3 in time to transfer the printed sheets to the endless carrier 6 of the printed sheet delivery mechanism.

The endless carrier 16 is shown as having a short upwardly inclined portion at the sheet receiving end and a long horizontal portion leading from the inclined portion to the sheet transfer end of the endless carrier.

The means for front and side registering the sheets before they reach the impression cylinder 2 is shown as including the following elements: Front sheet register devices 24 are carried by the gripper cross-bars 18 on the endless carrier 16. A side sheet register device 25 (in the present instance a flat bar) is mounted on a supporting bracket 26 on one side of the frame 1.

A fixed cam 27 is positioned to open the endless carrier grippers 17 for temporarily releasing the traveling sheets to permit them to be front and side registered before they are again taken by the endless carrier grippers 17 and transferred thereby to the impression cylinder grippers 3. A row of angularly positioned rollers 28 is mounted on the supporting brackets 26 located along both sides of the frame 1, beneath the horizontal portion of the endless carrier 16. These rollers 28 serve to support the traveling sheets while they are temporarily released from the endless carrier grippers 17. These angularly positioned rollers are driven at a higher surface speed than the impression cylinder 2 and endless carrier 16 so as to impart a combined forward and lateral additional movement to the temporarily released sheets to bring them into proper front and side register by contact with said front and side registering devices 24, 25.

After the traveling sheets have been registered, the endless carrier grippers 17 are again closed to grasp the leading ends of the sheets and advance them to the position where they are transferred by the endless carrier grippers 17 to the impression cylinder grippers 3.

To guide and support the traveling sheets, as they pass from the pinch rollers 10 and 11 through the pairs of friction rollers 12, 13 and 14, 15, to the endless carrier 16, there are provided upper and lower sheet combing belts 29 and 30, which belts are driven at a slightly higher surface speed than the said friction rollers, endless carrier and impression cylinder; to keep the sheets from wrinkling or buckling, especially as they are being forwarded by the second pairs of friction rollers 14, 15 to the endless carrier grippers 17. The upper combing belts 29 lead to the sheet receiving end of the endless carrier and the lower combing belts 30 lead along the underside of the sheet receiving end of the endless carrier to the sheet registering mechanism.

To permit the feeding of sheets of different lengths, the cross shafts 14* and 15* of the second pairs of friction rollers 14, 15 are mounted in said brackets 31 which may be adjusted along the racks 32 on the frame by providing the brackets with pinions 33 meshing with said racks 32. These pinions 33 are carried by a cross shaft 34 provided with a suitable operating hand wheel 35 and its lock lever 35*.

The means shown for driving the impression cylinder includes a motor 36 provided with a pul-

ley 37 operatively connected by a belt 38 to a pulley 39 on a cross shaft 40. This shaft 40 is provided with a pinion 41 which drives a gear 42 on the impression cylinder shaft 43. This gear 42 drives the form cylinder gears 44 which in turn drive the inking mechanism gears 45, 46.

The impression cylinder gear 42 also drives the sheet delivery endless carrier 6 through the gear 47 on the cross shaft 48. This gear 42 also drives the sheet feeding endless chain carrier 16 through the gear 49 on the sprocket cross shaft 50, which mounts the endless chain sprocket wheels 20 at the sheet transfer end of the endless carrier.

The sheet registering angularly positioned rollers 28 are shown as being driven at a higher surface speed than the endless carrier and the impression cylinder, from a separate motor 51 provided with a pulley 52 which is operatively connected by a belt 53 to a pulley 54 on a cross shaft 55. This cross shaft 55 is provided with a second pulley 56 which is operatively connected by a belt 57 to another pulley 58 mounted on a stud shaft 59 carried by a hanger 60 fastened to the adjacent bracket 26 by a bolt 61. This belt 57 is maintained in frictional contact with the undersides of the rollers 28 by a plurality of rollers 62 mounted on stud shafts 63 carried by hangers 64 fastened to the said bracket 26. The angularly positioned rollers 28 are mounted along each side of the frame 1 in bearings 65 secured on the longitudinally disposed brackets 26 by bolts 66.

An angle bar 67 extends along one of the brackets 26. Clamps 68 are secured at suitable intervals along the angle bar 67, which clamps adjustably position the cross rods 69 which carry the side register bar 25. The lower edge of this bar 25 is provided with curved recesses 70 for receiving the upper sides of the sheet registering rollers 28 for preventing the sheets which are being registered from sliding under the said bar.

The drive for the pairs of upper and lower friction rollers 12, 13 and 14, 15 for feeding the sheets to the sheet feeding endless chain carrier 16 at substantially the surface speed thereof, is shown as including the following elements: The cross shaft 71, which carries the sprocket wheels 19 at the sheet receiving end of the endless chain carrier 16, is shown as provided with a spur gear 72 which drives spur gear 73 on the cross shaft 74, which cross shaft is provided with a bevel gear 75 for driving the bevel gear 76 carried by a longitudinally disposed shaft 77. This shaft 77 is provided with another bevel gear 78 which drives the bevel gear 79 on a cross shaft 80. This cross shaft 80 is provided with a sprocket wheel 81 operatively connected by a chain 82 to a sprocket wheel 83 on the cross shaft 12*. This cross shaft 12* carries the upper friction rollers 12.

Pulleys 84 on the cross shaft 12* are operatively connected by belts 85 with pulleys 86 on a cross shaft 87 located adjacent the sheet receiving end of the endless chain carrier 16. These belts 85 frictionally contact the upper sides of pulleys 88 on the cross shaft 14* mounted by hangers 89 on the shaft 34. These belts 85 also pass in contact with the undersides of the take-up pulleys 90 mounted in arms 91 projecting from the adjustable brackets 31 so that the said brackets may be adjusted a short distance toward and away from the endless chain carrier 16 without unduly loosening the belts 85.

The cross shaft 80 is also provided with a sprocket wheel 92 operatively connected by a chain 93 to a sprocket wheel 94 on a cross shaft 95 which carries the pulleys 96 for the upper sheet combing belts 29. These belts 29 also pass around pulleys 97 on the said cross shaft 87.

The lower combing belts 30 operatively connect pulleys 98 on a cross shaft 99 adjacent the pinch rollers 10, 11 with pulleys 100 on a cross shaft 101 adjacent the sheet registering rollers 28. The cross shaft 99 is provided with a gear 102 which drives a gear 103 on the cross shaft 99 which carries the pulleys 98 of the lower combing belts 30.

The shaft 11* of the lower pinch rollers 11 is driven from the cross shaft 99 by a chain 104 which operatively connects a sprocket wheel 105 on the shaft 99 with a sprocket wheel 106 on the shaft 11* of the said lower pinch rollers.

The shaft 10* of the upper pinch rollers 10 is mounted in rock arms 107 fast to a cross shaft 108. These upper pinch rollers 10 may be raised and lowered by providing the shaft 10* with a vertical rod 109, the lower end of which rod is provided with a stud or roller 110 located in the groove of a box cam 111 mounted on a shaft 112, which shaft is provided with a sprocket wheel 113 operatively connected by a chain 114 to a sprocket wheel 115 on the shaft 77.

What I claim is:

1. In a sheet feeding and registering mechanism, a sheet receiving element provided with one or more sets of grippers, an endless carrier provided with spaced sets of grippers operable to take the sheets and feed them to the sheet receiving element, means for temporarily releasing the sheets from the endless carrier grippers, means for front and side registering the temporarily released sheets before they are again taken by the endless carrier grippers, and means for thereafter transferring the registered sheets from the endless carrier grippers to the sheet receiving element grippers.

2. In a sheet receiving and registering mechanism for rotary printing presses, an impression cylinder provided with one or more sets of grippers, an endless carrier provided with spaced sets of grippers operable to take the sheets and feed them to the impression cylinder, means for temporarily releasing the sheets from said endless carrier grippers, means for front and side registering the temporarily released sheets before they are again taken by the endless carrier grippers, and means for thereafter transferring the registered sheets from the endless carrier grippers to the impression cylinder grippers.

3. In a sheet feeding and registering mechanism, a sheet receiving element provided with one or more sets of grippers, an endless carrier provided with spaced sets of grippers operable to take the sheets and feed them to the sheet receiving element, means for temporarily releasing the sheets from said endless carrier grippers, front and side sheet registering devices, and a row of angularly positioned rollers cooperating therewith for front and side registering the temporarily released traveling sheets before they are again taken by the endless carrier grippers, and means for transferring the registered sheets from the endless carrier grippers to the sheet receiving element grippers.

4. In a sheet feeding and registering mechanism for rotary printing presses, an impression cylinder provided with one or more sets of grippers, an endless carrier provided with spaced sets of grippers operable to take the sheets and feed them to the impression cylinder, means for

temporarily releasing the sheets from the endless carrier grippers, front and side sheet registering devices, and a row of angularly positioned rollers cooperating therewith for front and side registering the temporarily released sheets before they are again taken by the endless carrier grippers, and means for thereafter transferring the registered sheets from the endless carrier grippers to the impression cylinder grippers.

5. In a sheet feeding and registering mechanism, a frame, a sheet receiving element provided with one or more sets of grippers, an endless carrier provided with spaced sets of grippers operable to take the sheets and feed them to the sheet receiving element, front and side sheet registering devices on the endless carrier and the frame respectively, means for temporarily releasing the sheets from the endless carrier grippers, means for imparting a combined forward and lateral additional movement to the temporarily released sheets to bring them into register with the said front and side registering devices before the sheets are again taken by the endless carrier grippers, and means for thereafter transferring the registered sheets from the endless carrier grippers to the sheet receiving element grippers.

6. In a sheet feeding and registering mechanism, a frame, a sheet receiving element, an endless carrier provided with means operable to take the sheets and feed them to the sheet receiving element, front and side sheet registering devices on the endless carrier and the frame respectively, means for temporarily releasing the sheets from the endless carrier, a row of angularly positioned rollers for imparting a combined forward and lateral additional movement to the temporarily released sheets to bring them into register with the said front and side registering devices before the sheets are again taken by the endless carrier, and means for thereafter transferring the registered sheets from the endless carrier to the sheet receiving element.

7. In a sheet feeding and registering mechanism, a frame, a sheet receiving element provided with one or more sets of grippers, an endless carrier provided with spaced sets of grippers operable to take the sheets and feed them to the sheet receiving element, front and side sheet registering devices on the endless carrier and the frame respectively, means for temporarily releasing the sheets from the endless carrier grippers, a row of angularly positioned rollers for imparting a combined forward and lateral additional movement to the temporarily released sheets to bring them into register with the said front and side registering devices before the sheets are again taken by the endless carrier grippers, and means for thereafter transferring the registered sheets from the endless carrier grippers to the sheet receiving element grippers.

8. In a sheet feeding and registering mechanism for rotary printing presses, a frame, an impression cylinder, an endless carrier provided with means operable to take the sheets and feed them to the impression cylinder, front and side sheet registering devices on the endless carrier and the frame respectively, means for temporarily releasing the sheets from the endless carrier, a row of angularly positioned rollers for imparting a combined forward and lateral additional movement to the temporarily released sheets to bring them into register with the said front and side registering devices before the sheets are again taken by the endless carrier, and means for thereafter transferring the registered sheets from the endless carrier to the impression cylinder.

9. In a sheet feeding and registering mechanism for rotary printing presses, a frame, an impression cylinder provided with one or more sets of grippers, an endless carrier provided with spaced sets of grippers operable to take the sheets and feed them to the impression cylinder grippers, front and side sheet registering devices on the endless carrier and the frame respectively, means for temporarily releasing the sheets from the endless carrier grippers, a row of angularly positioned rollers for imparting a combined forward and lateral additional movement to the temporarily released sheets to bring them into register with the said front and side registering devices before the sheets are again taken by the endless carrier grippers, and means for thereafter transferring the sheets from the endless carrier grippers to the impression cylinder grippers.

10. In a sheet feeding and registering mechanism, a frame, a sheet receiving element, an endless carrier provided with grippers operable to take the sheets and feed them to the receiving element, front and side sheet register devices on the endless carrier and frame respectively, means for temporarily releasing the sheets from the endless carrier, a row of angularly positioned sheet supporting rollers for imparting a combined forward and lateral additional movement to the temporarily released traveling sheets to bring them into register with said front and side register devices before the sheets are again taken by the endless carrier, and means for thereafter transferring the registered sheets from the said endless carrier to the said sheet receiving element, the sheet receiving element and the endless carrier being driven at substantially the same surface speed and the sheet registering rollers being driven at a higher surface speed.

11. In a sheet feeding and registering mechanism for rotary printing presses, a frame, an impression cylinder, an endless carrier provided with grippers operable to take the sheets and feed them to the impression cylinder, front and side sheet register devices on the endless carrier and the frame respectively, means for temporarily releasing the sheets from the endless carrier, a row of angularly positioned sheet supporting rollers for imparting a combined forward and lateral additional movement to the temporarily released sheets to bring them into register with said front and side register devices before the sheets are again taken by the endless carrier, and means for thereafter transferring the registered sheets from the said endless carrier to the said impression cylinder, the impression cylinder and the endless carrier being driven at substantially the same surface speed and the sheet registering rollers being driven at a higher surface speed.

12. In a sheet feeding and registering mechanism, a sheet receiving cylinder, an endless carrier provided with grippers operable to take the sheets and feed them to the sheet receiving cylinder, coacting friction rollers for feeding sheets to the endless carrier, means for temporarily releasing the sheets from the endless carrier, means for front and side registering the temporarily released sheets before they are again taken by the endless carrier, and means for thereafter transferring the registered sheets

from the endless carrier to the sheet receiving cylinder.

13. In a sheet feeding and registering mechanism, a sheet receiving cylinder, an endless carrier provided with grippers operable to take the sheets and feed them to the sheet receiving cylinder, first and second pairs of coacting friction rollers for feeding sheets to the endless carrier, the second pairs of friction rollers being adjustable toward and away from the endless carrier for feeding sheets of different lengths thereto, means for temporarily releasing the sheets from the endless carrier, means for front and side registering the temporarily released sheets before they are again taken by the endless carrier, and means for thereafter transferring the registered sheets from the endless carrier to the sheet receiving cylinder.

14. In a sheet feeding and registering mechanism, a sheet receiving cylinder, an endless carrier provided with grippers operable to take the sheets and feed them to the sheet receiving cylinder, coacting friction rollers for feeding sheets to the endless carrier, means for temporarily releasing the sheets from the endless carrier, means for front and side registering the temporarily released sheets before they are again taken by the endless carrier, and means for thereafter transferring the registered sheets from the endless carrier to the sheet receiving cylinder, the sheet receiving cylinder, the endless carrier and the friction rollers all being driven at substantially the same surface speed and the sheet registering means being driven at a higher surface speed.

15. In a sheet feeding and registering mechanism, a sheet receiving cylinder, an endless carrier provided with grippers operable to take the sheets and feed them to the sheet receiving cylinder, first and second pairs of coacting friction rollers for feeding sheets to the endless carrier, the second pairs of friction rollers being adjustable toward and away from the endless carrier for feeding sheets of different lengths thereto, means for temporarily releasing the sheets from the endless carrier, means for front and side registering the temporarily released sheets before they are again taken by the endless carrier, and means for thereafter transferring the registered sheets from the endless carrier to the sheet receiving cylinder, the sheet receiving cylinder, the endless carrier and the friction rollers all being driven at substantially the same surface speed and the sheet registering means being driven at a higher surface speed.

16. In a sheet feeding and registering mechanism, a sheet receiving cylinder, an endless carrier provided with grippers operable to take the sheets and feed them to the sheet receiving cylinder, pairs of coacting friction rollers for feeding sheets to the endless carrier, upper and lower sheet combing belts coacting to guide the sheets to the endless carrier, means for temporarily releasing the sheets from the endless carrier, means for front and side registering the temporarily released sheets before they are again taken by the endless carrier, and means for thereafter transferring the registered sheets from the endless carrier to the sheet receiving cylinder.

17. In a sheet feeding and registering mechanism, a sheet receiving cylinder, an endless carrier provided with grippers operable to take the sheets and feed them to the sheet receiving cylinder, coacting friction rollers for feeding sheets to the endless carrier, upper and lower sheet combing belts coacting to guide the sheets to the endless carrier, means for temporarily releasing the sheets from the endless carrier, means for front and side registering the temporarily released sheets before they are again taken by the endless carrier, and means for thereafter transferring the registered sheets from the endless carrier to the sheet receiving cylinder, the sheet receiving cylinder, the endless carrier and the friction rollers all being driven at substantially the same surface speed, the combing belts being driven at a slightly higher surface speed, and the sheet registering means being driven at a higher surface speed than the sheet receiving cylinder, endless carrier and friction rollers.

18. In a sheet feeding and registering mechanism, a sheet receiving cylinder, an endless carrier provided with grippers operable to take the sheets and feed them to the sheet receiving cylinder, first and second pairs of coacting friction rollers for feeding sheets to the endless carrier, upper and lower sheet combing belts coacting to guide the sheets to the endless carrier, the second pairs of friction rollers being adjustable toward and away from the endless carrier for feeding sheets of different lengths thereto, means for temporarily releasing the sheets from the endless carrier, means for front and side registering the temporarily released sheets before they are again taken by the endless carrier, and means for thereafter transferring the registered sheets from the endless carrier to the sheet receiving cylinder.

19. In a sheet feeding and registering mechanism, a sheet receiving cylinder, an endless carrier provided with grippers operable to take the sheets and feed them to the sheet receiving cylinder, first and second pairs of coacting friction rollers for feeding sheets to the endless carrier, upper and lower sheet combing belts coacting to guide the sheets to the endless carrier, the second pairs of friction rollers being adjustable toward and away from the endless carrier for feeding sheets of different lengths thereto, means for temporarily releasing the sheets from the endless carrier, means for front and side registering the temporarily released sheets before they are again taken by the endless carrier, and means for thereafter transferring the registered sheets from the endless carrier to the sheet receiving cylinder, the sheet receiving cylinder, the endless carrier and the friction rollers all being driven at substantially the same surface speed, the combing belts being driven at a slightly higher surface speed, and the sheet registering means being driven at a higher surface speed than the sheet receiving cylinder, endless carrier and friction rollers.

20. In a sheet feeding and registering mechanism, a sheet receiving cylinder, an endless carrier provided with grippers operable to take the sheets and feed them to the sheet receiving cylinder, first and second pairs of coacting friction rollers for feeding sheets to the endless carrier, upper and lower sheet combing belts coacting to guide the sheets to the endless carrier, pairs of coacting pinch rollers for feeding sheets from a sheet supply source to said pairs of friction rollers, means for temporarily releasing the sheets from the endless carrier, and means for front and side registering the temporarily released sheets before they are again taken by the endless carrier.

21. In a sheet feeding and registering mechanism, a sheet receiving cylinder, an endless carrier provided with grippers operable to take the sheets and feed them to the sheet receiving cylinder, first and second pairs of coacting friction rollers for feeding sheets to the endless carrier, upper and lower sheet combing belts coacting to guide the sheets to the endless carrier, pairs of coacting pinch rollers for feeding sheets from a sheet supply source to said pairs of friction rollers, means for temporarily releasing the sheets from the endless carrier, and means for front and side registering the temporarily released sheets before they are again taken by the endless carrier, the sheet receiving cylinder, the endless carrier and the friction rollers all being driven at substantially the same surface speed, the combing belts at a slightly higher surface speed and the pinch rollers at a lower surface speed than the sheet receiving cylinder, the endless carrier and friction rollers.

22. In a sheet feeding and registering mechanism, a sheet receiving cylinder, an endless carrier provided with grippers operable to take the sheets and feed them to the sheet receiving cylinder, first and second pairs of coacting friction rollers for feeding sheets to the endless carrier, upper and lower sheet combing belts coacting to guide the sheets to the endless carrier, pairs of coacting pinch rollers for feeding sheets from a sheet supply source to said pairs of friction rollers, means for temporarily releasing the sheets from the endless carrier, and means for front and side registering the temporarily released sheets before they are again taken by the endless carrier, the sheet receiving cylinder, the endless carrier and the friction rollers all being driven at substantially the same surface speed, the combing belts at a slightly higher surface speed, the pinch rollers at a lower surface speed than the sheet receiving cylinder, the endless carrier and friction rollers, and the sheet registering means being driven at a higher surface speed than the said sheet receiving cylinder, endless carrier and friction rollers.

23. In a sheet feeding and registering mechanism, a sheet receiving cylinder, an endless chain carrier provided with spaced sets of grippers operable to take sheets fed thereto and to transfer the sheets, after they have been registered, to the said cylinder, means for temporarily releasing the sheets from the endless carrier grippers before they reach the sheet receiving cylinder, and means for front and side registering the temporarily released traveling sheets before they are again taken by the endless carrier grippers.

24. In a sheet feeding and registering mechanism, a sheet receiving cylinder, an endless chain carrier provided with spaced sets of grippers operable to take sheets fed thereto and to transfer the sheets, after they have been registered, to said cylinder, means for temporarily releasing the sheets from the endless carrier grippers before they reach the sheet receiving cylinder, and means for imparting a combined forward and lateral additional movement to the temporarily released traveling sheets to register them before they are again taken by the endless carrier grippers.

25. In a sheet feeding and registering mechanism, a frame, a sheet receiving cylinder, an endless chain carrier provided with spaced sets of grippers operable to take sheets fed thereto and to transfer the sheets, after they have been registered, to said cylinder, means for temporarily releasing the sheets from the endless carrier before they reach the sheet receiving cylinder, front and side register devices on the endless carrier and frame respectively, and means for imparting a combined forward and lateral additional movement to the temporarily released traveling sheets to bring them into register with said front and side register devices, before the sheets are again taken by the endless carrier grippers.

26. In a sheet feeding and registering mechanism, a sheet receiving cylinder, an endless chain carrier provided with spaced sets of grippers operable to take sheets fed thereto and to transfer the sheets, after they have been registered, to said cylinder, means for temporarily releasing the sheets from the endless carrier grippers before they reach the sheet receiving cylinder, means for front and side registering the temporarily released traveling sheets before they are again taken by the endless carrier grippers, means for driving the sheet receiving cylinder and the endless carrier at substantially the same surface speeds, and a separate means for driving the sheet registering means at a higher surface speed.

HANS J. LUEHRS.

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