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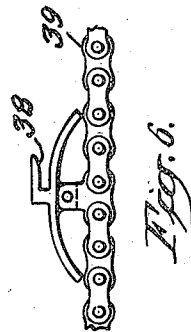
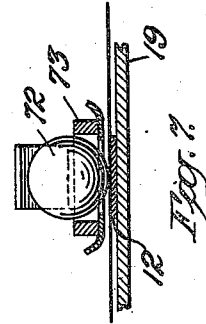
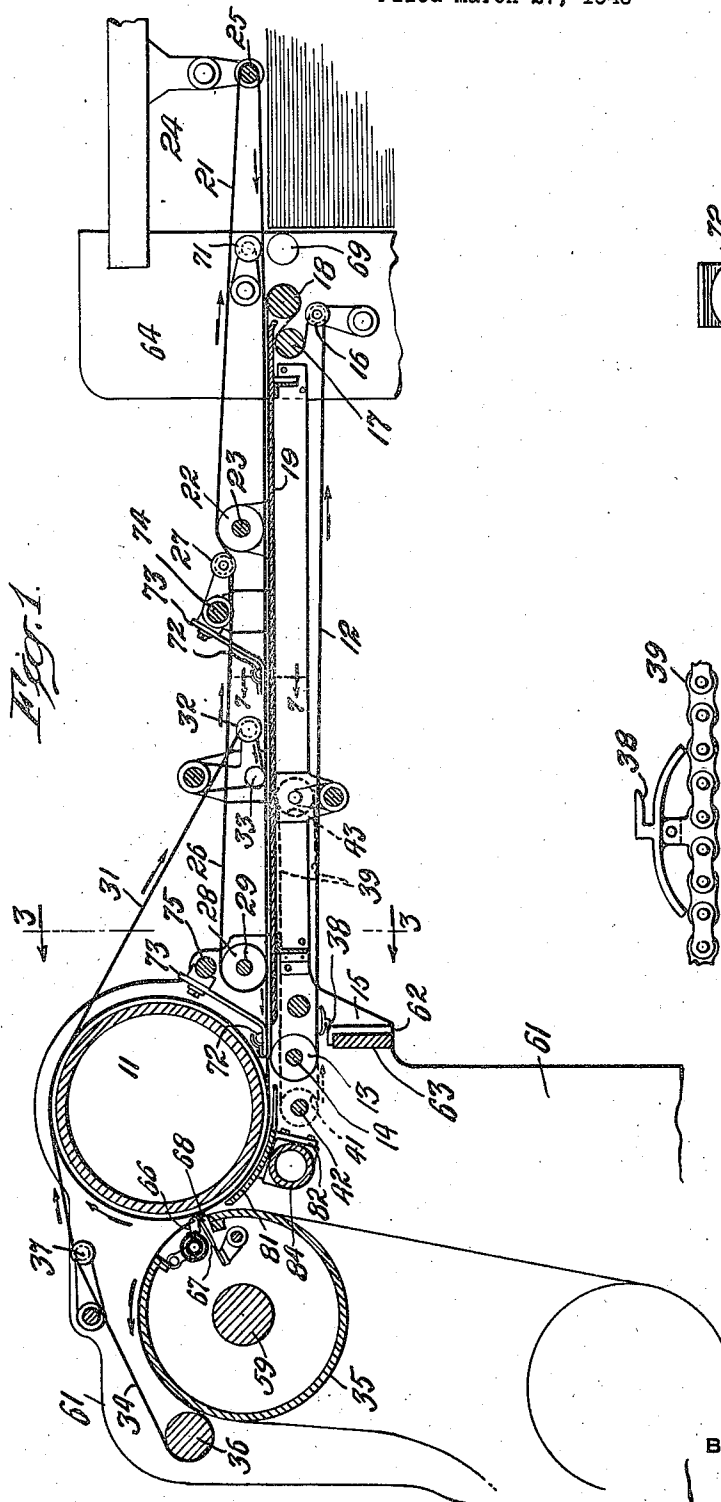
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2,406,006

SHEET FEEDING MECHANISM

Filed March 27, 1943

3 Sheets-Sheet 1



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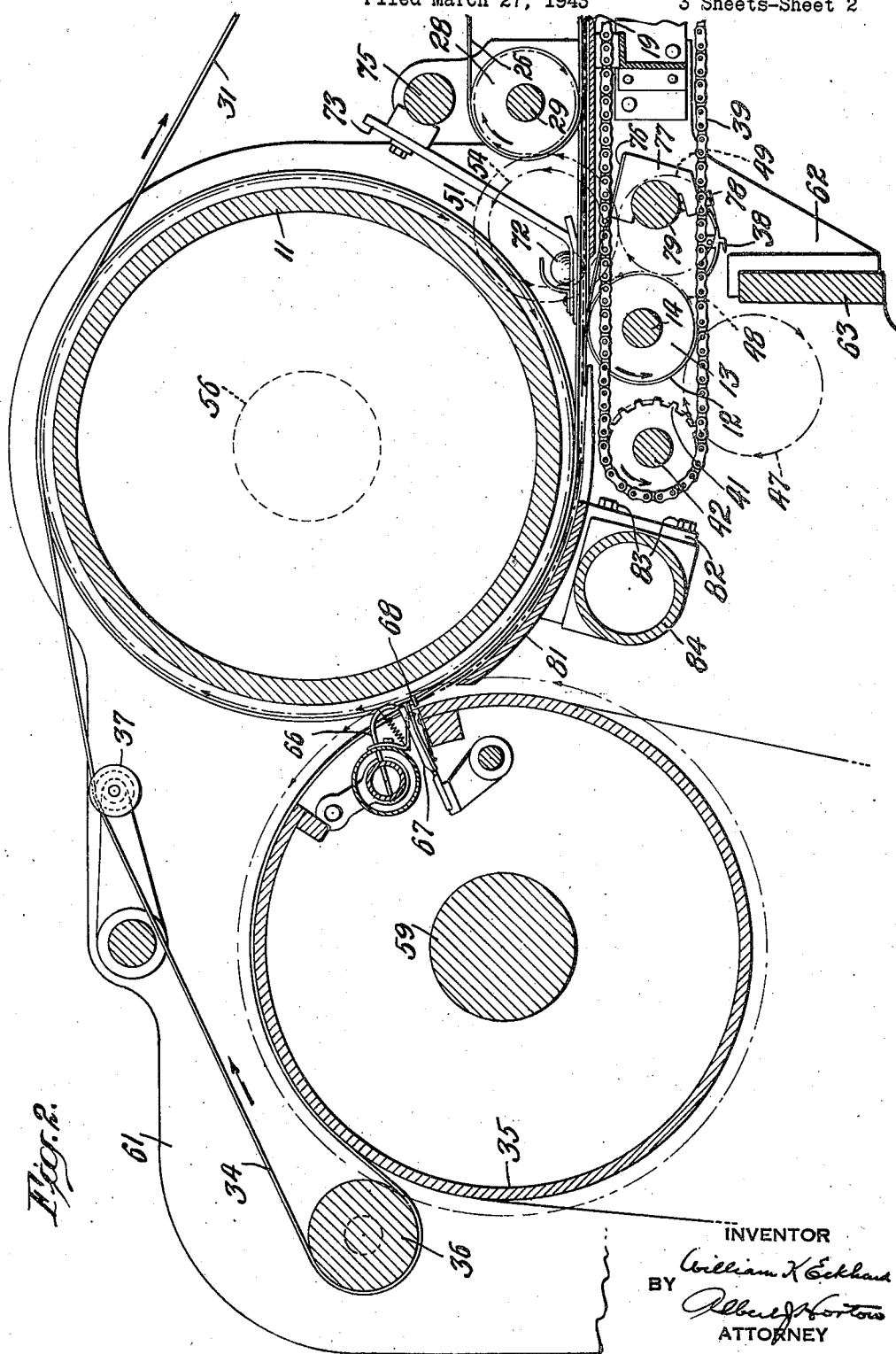
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SHEET FEEDING MECHANISM

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3 Sheets-Sheet 2



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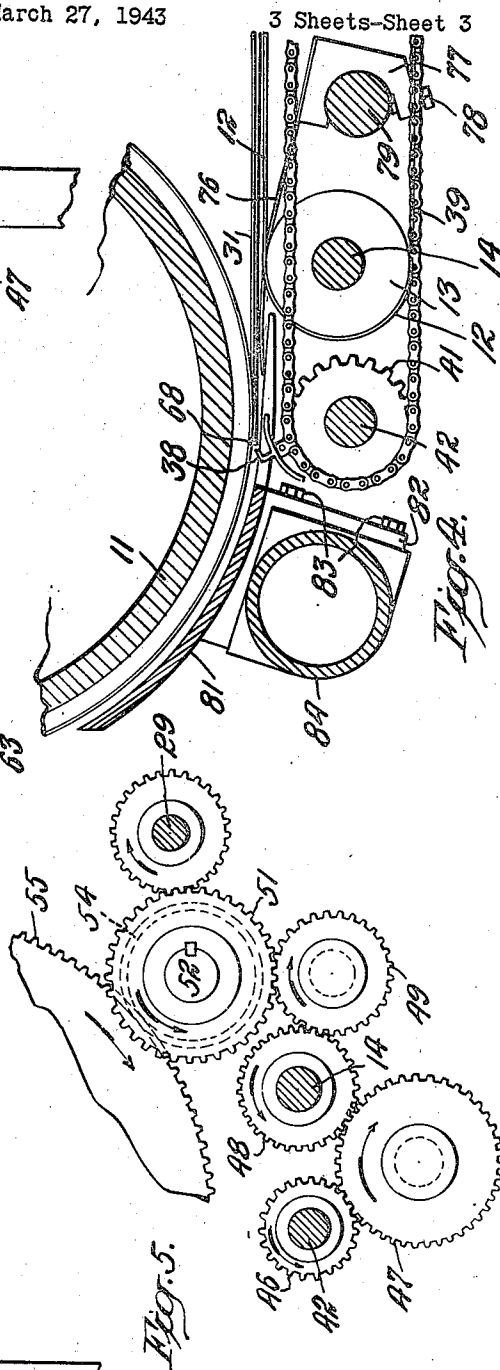
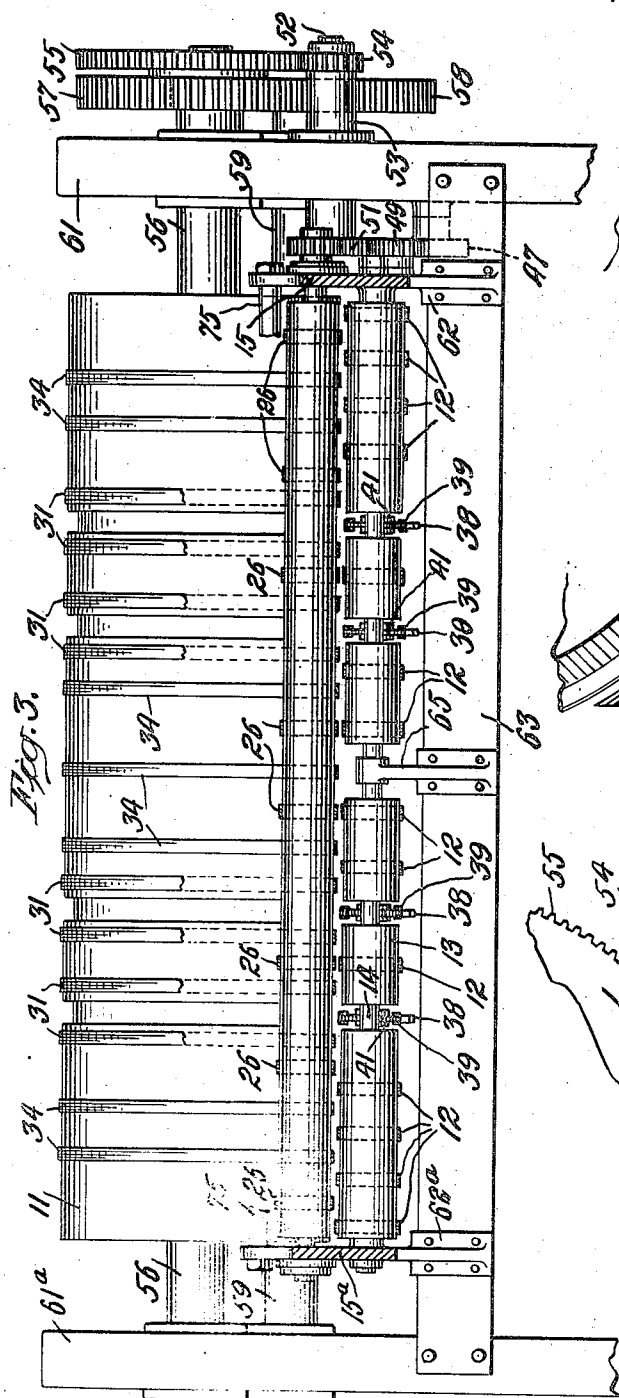
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2,406,006

SHEET FEEDING MECHANISM

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Application March 27, 1943, Serial No. 480,741

19 Claims. (Cl. 271—50)

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This invention relates to sheet feeding mechanism for rotary printing machines, especially machines of the type described in Patent No. 2,231,914, in which the sheets are fed to a rotating cylinder on which they are registered without interrupting their motion into the machine.

By employing the invention herein disclosed, the leading edge of each sheet when fed to such a machine is registered as it moves forward toward the machine, and is brought to and held in accurate register during its forward motion to the printing machine.

An object of the invention is to provide a sheet feeding mechanism that will register the leading edge of a sheet of paper or other flexible material in transit from a pile of sheets to a printing machine and deliver the sheet to a rotating element of the machine with its leading edge in accurate register and without stopping the sheet.

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

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combinations and arrangements of parts, and in the details of construction hereinafter described and claimed, it being understood that various changes in the precise embodiment of the invention herein disclosed may be made within the scope of what is claimed without departing from the spirit of the invention.

The preferred embodiment of the invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a vertical sectional view of a portion of a printing machine having a sheet feeder, and showing the invention applied thereto;

Figure 2 is an enlarged view similar to a portion of Figure 1, and including additional parts of the mechanism;

Figure 3 is a view of certain parts of the mechanism as seen on the broken line 3—3 in Figure 1, in the direction of the arrows, and showing the parts in their relative positions when a sheet is being transferred to the printing machine;

Figure 4 is a view of a portion of Figure 2, showing the position of parts at an earlier period in the motion of a sheet toward the machine;

Figure 5 is a view showing the driving gears whereby the mechanism of the invention is driven

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in proper timed relation with the printing machine;

Figure 6 is an enlarged view of the sheet registering stop; and

Figure 7 is a sectional view of a ball traction device employed in the machine, and as seen on the line 7 of Figure 1, in the direction of the arrows.

Referring to the drawings, and especially to Figure 1, a sheet feeding mechanism is shown which includes a sheet timing cylinder 11 to which sheets are forwarded by sheet carrying belts 12. From the sheet timing cylinder 11 the sheets are transferred to a sheet receiving cylinder of a printing machine, which may be the cylinder 13 of Patent 2,231,914, that carries sheet stops against which the front edge of a sheet is pressed by the sheet carrying belts 12, and gripper mechanism adapted to hold the sheet and also the side registering mechanism, all of which is fully disclosed in the drawings and specification of the patent mentioned.

The sheet carrying belts 12 are driven by pulleys 13, secured to a shaft 14, that is rotatably supported in side frame members 15 and 15a. From the pulleys 13, the belts 12 are led around a belt tightening pulley 16, thence about pulleys 17 and 18 and they return along the feed board 19 to the pulley 13.

First over-sheet belts 21 are led around pulleys 22, that are rotatably supported on a shaft 23, carried by side frame members 15 and 15a, each belt 21 being led also around a belt tightening pulley 25 suitably supported over a pile of sheets in a conventional sheet feeder 24.

Second over-sheet belts 26 are led around pulleys 22 and tightening pulleys 27, and driven by pulleys 28 secured to a shaft 29 rotatably supported in side frame members 15 and 15a.

Third over-sheet belts 31 are led around the sheet timing cylinder 11, guide pulleys 33, and belt tightening pulleys 32.

Fourth over-sheet belts 34 also are led around the sheet timing cylinder 11, over a sheet receiving cylinder 35, about guide pulleys 36, and belt tightening pulleys 37.

A sheet retarding device (Figures 2, 4, and 6), includes sheet stop members 38 carried on chains 39 which are supported on and driven by sprockets 41 secured to a sprocket shaft 42 that is rotatably supported in the side frame members 15 and 15a. An idler sprocket 43 supports the chain 39 at the opposite end of its run.

A gear 46 (Figure 5) is secured on the sprocket shaft 42 and meshes with an idler gear 47, that

in turn meshes with a gear 48, secured on the shaft 14, which drives the pulleys 13 (Figure 3) and thereby the sheet carrying belts 12. The gear 48 (Figure 5) meshes with an idler gear 49, which in turn is driven by a gear 51 secured to a shaft 52 rotatably supported in a bearing bushing 53 (Figure 3) secured to the side frame member 61. Gear 54 is secured to the outer end of the shaft 52 and meshes with a gear 55, secured on shaft 56 of the sheet timing cylinder 11. A gear 57 also secured on the shaft 56 meshes with a gear 58, secured on a shaft 59 of the sheet receiving cylinder 35.

The sheet timing cylinder shaft 56 is journaled in the main frame members 61 and 61a, while the rotating shafts carrying the pulleys 13 are journaled in the side frame members 15 and 15a, which have lugs 62 and 62a respectively, that are suitably secured to a cross member 63 of the main frame. The opposite ends of the side frame members 15 and 15a are each secured to a feeder frame member 64. The shaft 14 is provided with an intermediate bearing formed in a bracket 65 suitably secured to the cross member 63.

The sheet receiving cylinder 35 (Figure 2) carries grippers 66 and sheet stops 67 preferably arranged as fully disclosed in Patent 2,231,914. Other sheet stops 68 project from the periphery of the sheet timing cylinder 11. The sheet stops 67 and 68 are arranged in different planes transversely of the cylinders 11 and 35, to avoid interference of the stops 67 with the stops 68. The diameter of the sheet timing cylinder 11 is slightly greater than the diameter of the sheet receiving cylinder 35, although they are geared together to run at the same angular velocity, and their sheetstops are all in alignment in a plane common to the axes of both cylinders when a sheet is transferred from the cylinder 11 to the cylinder 35. It will thus be seen that the stops on the sheet timing cylinder 11 are behind the stops on the sheet taking cylinder as they approach their closest positions, but the stops on the timing cylinder overtake the stops on the sheet taking cylinder at this point. Thereafter, the stops on the timing cylinder move ahead of the stops on the sheet taking cylinder and clear of the edge of the sheet.

The third and fourth over-sheet belts 31 and 34 wrap about a large portion of the periphery of the sheet timing cylinder 11, and consequently are driven at substantially the same speed as that cylinder. The chain 39 carrying the sheet stops 38 is driven at a slightly faster speed than the belts 31, and the sheet carrying belts 12 are driven at a speed slightly faster than the chain 39. The second over-sheet belts 26 are driven by the pulleys 28 and drive the pulleys 22, which in turn drive the first over-sheet belts 21. The belts 26 and 21 thus run at substantially the same speed, the arrangement preferably being such that this speed is slightly higher than that of the sheet carrying belts 12.

The third and fourth over-sheet belts 31 and 34, may be driven at a speed 8% above the speed of the sheet receiving cylinder 35, the sheet stops 38 at a speed 12% above that of the sheet receiving cylinder, the sheet carrying belts 12 at a speed 20% above the sheet receiving cylinder, and the over-sheet belts 21 and 26 at any speed slightly higher than the sheet carrying belts 12.

When a sheet is separated from the pile on the feeder 24 by the usual sheet separating and forwarding mechanism, it is propelled forward by conventional forwarding rollers 69 and 71, which

are operated in accordance with the usual practice to propel the sheet forward to the belts 12 and 21 which carry it forward to the pulleys 22 after which it is carried between belts 12 and 26.

Traction balls 72 (Figures 1 and 2), loosely held in a guide member 73, are secured to cross bars 74 and 75. These traction balls are placed directly over certain of the sheet carrying belts 12 and serve to press the sheet against the belts and insure movement of the sheet at substantially the speed of the belt. The sheet moves forward with the sheet carrying belts 12 until the forward edge of the sheet overtakes the stop members 38 which are moving at a slightly slower speed. The leading edge of the sheet will thus be pressed against the stop members and be brought into alignment therewith. Thereafter some slippage occurs between the sheet carrying belts 12 and the sheet, and this acts to constantly urge the leading edge of the sheet forward against the stops 38. The stops 68 on the sheet timing cylinder 11 are timed to meet the leading edge of the sheet and the sheet is pressed against these stops when it reaches the position shown in Figure 4.

As each stop 38 is carried around a sprocket 41, its motion is accelerated due to the stop being at a greater radial distance from the axis of the shaft 42 than the pitch line of the chain 39, hence the stop 38 is moved forward from the edge of the sheet, the motion of the sheet then being slightly accelerated by the sheet carrying belts 12, but it is later slightly decelerated due to the slower speed of the cylinder 11. A plurality of sheet deflectors 76 are suitably secured to clamps 77 having locking screws 78, whereby they are secured to a cross rod 79 that is supported by side frame members 15 and 15a. A plurality of guides 81 are shaped to conform with the periphery of the cylinder 11 and have brackets 82 and screws 83, whereby they are secured to a tubular cross member 84 that is supported by the side frame members 15 and 15a. The sheet deflectors 76 in cooperation with the sheet guides 81 act to direct the sheet away from the belts 12 and the sheet stops 38 and toward the periphery of the sheet timing cylinder 11.

The leading edge of the sheet is then pressed against the stops 68 and it moves forward with the cylinder 11, until it meets the stops 67 which still further decelerate it to the speed of the sheet receiving cylinder 35, and it is then taken by grippers 66.

From the foregoing, it will be seen that with the mechanism herein disclosed, a sheet forwarded from a pile feeder, or other sheet supply device, is propelled first by the forwarding rollers 69 and 71 and guided by the first over-sheet belts 21 to engagement with the sheet carrying belts 12, which preferably are driven approximately 20% faster than the speed of the sheet receiving cylinder 35. These belts carry the sheet forward and beyond the belts 21 to the second over-sheet belts 26 and under the traction balls 72 at the cross bar 74, thus holding the sheet in intimate contact with the carrying belts 12.

The sheet is thus carried forward until its leading edge engages sheet stop members 38 carried by the chains 39. These stop members preferably are driven at a speed approximately 12% faster than the peripheral speed of the sheet receiving cylinder and act to decelerate the sheet slightly and to align its leading edge parallel with the axis of the sheet receiving cylinder 35, the carrying belts and the over-sheet belts meanwhile acting

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to urge the sheet forward and press it against the stop members 38.

The motion of the sheet thusly controlled is continued past the traction balls 72 at the cross bar 75, and until the leading edge of the sheet approaches the sheet timing cylinder 11, the relation of the parts is such that the sheet stops 68, which are spaced along the cylinder 11, will be slightly in advance of the sheet. The peripheral speed of the cylinder 11 is preferably 8% higher than that of the sheet receiving cylinder 35, and the speed of the belts 12 and 26 being still higher, the leading edge of the sheet overtakes the sheet stops 68 and is pressed against them under the urge of the sheet carrying belts 12 and the over-sheet belts 26, thus further decelerating it. Meanwhile, the sheet stop members 38 are moved out of the path of the sheet and away from its forward edge by passing around the sprocket 41, the sheet being prevented from following the sheet stop, by sheet deflectors 76 and sheet guides 81 which conform to the periphery of the sheet timing cylinder 11. The sheet has meanwhile been engaged by the over-sheet belts 31, which run between it and the sheet timing cylinder 11.

After the leading edge of the sheet, which is then pressed against the stops 68 on the cylinder 11, reaches the position shown in Figure 2, the sheet edge is firmly pressed against stops 67 on the sheet receiving cylinder 35 which still further decelerates it, and it is then held firmly pressed against the stops 67 by the over-sheet belts 34 which, being driven by the sheet timing cylinder 11, run slightly faster than the peripheral speed of the sheet receiving cylinder 35.

When the mechanism herein disclosed is employed in connection with the registering cylinder disclosed in Patent 2,231,914, the sheet is side registered during a short interval immediately after the parts move forward from the positions shown in Figures 1 and 2, after which the grippers 66 close on the sheet which is then in accurate register both longitudinally and transversely.

It will be seen that the mechanism herein disclosed provides means for controlling a sheet moving from a sheet feeder to a printing machine, so that its leading edge is pressed against moving stops which sequentially slightly reduce the speed at which the sheet travels, and the sheet is presented to the printing machine with its front edge in accurate register, thereby permitting operation at higher speeds than has heretofore been possible.

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 had to the claims rather than to the foregoing description to indicate the scope of the invention.

What I claim is:

1. In a sheet feeding mechanism for a printing machine having a sheet receiving cylinder carrying grippers to hold the sheet, a sheet timing cylinder having sheet stops fixed thereon and continuously driven in timed angular relation with the sheet receiving cylinder and at a slightly higher peripheral speed, and sheet advancing means arranged to forward a sheet from a sheet supply device to the sheet timing cylinder at a slightly higher speed than the peripheral speed of the timing cylinder, whereby the sheet may be forwarded from the pile to the timing cylinder and taken in proper front register by the grippers

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carried by the sheet receiving cylinder without stopping the sheet.

2. In a sheet feeding mechanism for a printing machine having a sheet receiving cylinder carrying sheet stops against which the leading edge of a sheet is registered and grippers to hold the sheet, a sheet timing cylinder having sheet stops fixed thereon and continuously driven in timed angular relation with the sheet receiving cylinder and at a slightly higher peripheral speed, and sheet advancing means arranged to forward a sheet from a sheet supply device to the sheet timing cylinder at a slightly higher speed than the peripheral speed of the timing cylinder, whereby the sheet may be forwarded from the pile to the timing cylinder and taken in proper front register by the grippers carried by the sheet receiving cylinder without stopping the sheet.

3. In a sheet feeding mechanism for a printing machine having a sheet receiving cylinder carrying sheet stops against which the leading edge of a sheet is registered and grippers to hold the sheet, a sheet timing cylinder having sheet stops fixed thereon and driven in timed angular relation with the sheet receiving cylinder and at a slightly higher peripheral speed, sheet advancing means arranged to forward a sheet from a sheet supply device to the sheet timing cylinder at a slightly higher speed than the peripheral speed of the timing cylinder, and sheet retarding means having sheet stops and driven in timed relation with the sheet timing cylinder at a speed intermediate the speed of the sheet advancing means and that of the sheet timing cylinder and against which the leading edge of a sheet is pressed by the sheet advancing means, whereby the sheet may be forwarded from the pile to the timing cylinder and taken in proper front register by the grippers carried by the sheet receiving cylinder without stopping the sheet.

4. In a sheet feeding mechanism for a printing machine having a sheet receiving cylinder, sheet advancing means arranged to forward a sheet from a sheet supply device to the printing machine, including sheet carrying belts driven in timed relation with the machine and at a speed somewhat higher than the peripheral speed of the sheet receiving cylinder, stop members moving in timed relation with the machine and at a speed slightly slower than the speed of the sheet carrying belts, and a sheet timing cylinder having sheet stops fixed thereon adapted to engage the leading edge of the sheet and continuously driven in timed angular relation with the sheet receiving cylinder at a speed slightly slower than the said stop members and slightly faster than the peripheral speed of the sheet receiving cylinder.

5. In a sheet feeding mechanism for a printing machine having a sheet receiving cylinder, sheet advancing means arranged to forward a sheet from a sheet supply device to the printing machine, including sheet carrying belts driven in timed relation with the machine and at a speed somewhat higher than the peripheral speed of the sheet receiving cylinder, other belts arranged to hold the sheets against the sheet carrying belts and driven at a slightly higher speed than the sheet carrying belts, stop members moving in timed relation with the machine and at a speed slightly slower than the speed of the sheet carrying belts, and a sheet timing cylinder having sheet stops adapted to engage the leading edge of the sheet and driven in timed relation with the machine at a speed slightly slower than the said stop members.

6. In a sheet feeding mechanism for a printing machine having a sheet receiving cylinder, sheet advancing means arranged to forward a sheet from a sheet supply device to the printing machine, including sheet carrying belts driven in timed relation with the machine and at a speed somewhat higher than the peripheral speed of the sheet receiving cylinder, traction balls arranged to press the sheets against the sheet carrying belts, stop members moving in timed relation with the machine and at a speed slightly slower than the speed of the sheet carrying belts, and a sheet timing cylinder having sheet stops adapted to engage the leading edge of the sheet and driven in timed relation with the machine at a speed slightly slower than the said stop members.

7. In a sheet feeding mechanism for a rotary printing machine having a rotating member to which sheets are fed, a sheet supply device having means for forwarding individual sheets, sheet carrying belts to receive the sheets from the sheet forwarding means, stop members moving in timed relation with the machine and at a speed slightly slower than the speed of the sheet carrying belts, and sheet timing means having sheet stops fixed thereon adapted to engage the leading edge of a sheet and continuously driven in timed angular relation with the said rotating member at a slightly slower speed than the said stop members, and at a slightly higher speed than the rotating member.

8. In a sheet feeding mechanism for a rotary printing machine having a sheet receiving cylinder with sheet stops and to which sheets are fed, a sheet supply device having means for forwarding individual sheets, sheet carrying belts to receive the sheets from the sheet forwarding means, means to press the sheets against the sheet carrying belts, stop members moving in timed relation with the machine and at a speed slightly slower than the speed of the sheet carrying belts, a sheet timing cylinder having sheet stops adapted to engage the leading edge of a sheet and driven in timed relation with the machine at a slightly slower speed than the said stop members and at a slightly higher peripheral speed than the peripheral speed of the sheet receiving cylinder, and other sheet belts driven slightly faster than the sheet receiving cylinder to press a sheet against the sheet receiving cylinder and urge its leading edge against the stops thereon.

9. In a sheet feeding mechanism for a printing machine having a sheet receiving cylinder with stops to which sheets are registered, a sheet supply device having means for forwarding individual sheets, sheet carrying belts to receive a sheet from the sheet forwarding means, first sheet pressing means to press the sheet against the belts, stop members moving in timed relation with the machine and at a speed slightly slower than the speed of the sheet carrying belts, a sheet timing cylinder having sheet stops adapted to engage the leading edge of a sheet and driven in timed relation with the machine at a slightly slower speed than the said stop members, and at a slightly higher peripheral speed than the peripheral speed of the sheet receiving cylinder, and other sheet pressing means driven by the sheet timing cylinder to urge the sheet forward on the sheet receiving cylinder.

10. In a sheet feeding mechanism for a printing machine having a rotating cylinder with sheet stops to which sheets are fed, a sheet supply device having means for forwarding individual

sheets, sheet carrying means driven at a speed slightly higher than the peripheral speed of the rotating cylinder and adapted to move the sheets to the rotating cylinder, and sheet engaging members continuously driven at a speed slightly higher than the speed of the rotating cylinder and adapted to engage a sheet moved by the sheet carrying means and press it against the rotating cylinder and against the sheet stops thereon.

11. In a sheet feeding mechanism for a printing machine having a sheet receiving cylinder, a continuously rotating sheet timing cylinder having sheet stops, and sheet advancing means arranged to continuously forward a sheet from a sheet supply device to the sheet receiving cylinder and meanwhile to first press its leading edge against the stops on the sheet timing cylinder, and then to strip it therefrom.

12. In a sheet feeding mechanism for a printing machine having a sheet receiving cylinder, sheet grippers associated with the sheet receiving cylinder and arranged to hold a sheet thereon, a continuously rotating sheet timing cylinder having sheet stops, and sheet advancing means arranged to continuously forward a sheet from a sheet supply device to the sheet receiving cylinder and hold it thereon until it is engaged by the grippers; the sheet advancing means being arranged to first press the leading edge of the sheet against the stops on the sheet timing cylinder and then to strip it therefrom.

13. In a sheet feeding mechanism for a printing machine having a sheet receiving cylinder, a continuously rotating sheet timing cylinder having sheet stops for positioning the leading edge of the sheet, sheet advancing means arranged to uninterruptedly forward a sheet from a sheet supply device to the sheet timing cylinder and press its leading edge against the stops, and means for transferring the sheet from the timing cylinder to the sheet receiving cylinder and positioning it thereon in accurate register.

14. In a sheet feeding mechanism for a printing machine having a sheet receiving cylinder, sheet grippers associated with the sheet receiving cylinder and arranged to hold the sheet thereon, a continuously rotating sheet timing cylinder having sheet stops, first sheet advancing belts arranged to continuously forward a sheet from a sheet supply device to the sheet timing cylinder and second sheet advancing belts arranged to press the leading edge of the sheet against the sheet receiving cylinder.

15. In a sheet feeding mechanism for a printing machine having a sheet receiving cylinder with sheet registering stops, a continuously rotating sheet timing cylinder having other sheet stops associated therewith, sheet advancing means arranged to forward a sheet from a sheet supply device to the sheet timing cylinder and to further forward the sheet to the receiving cylinder at a slightly reduced speed.

16. In a sheet feeding mechanism for a printing machine having a sheet receiving cylinder, sheet advancing means arranged to forward a sheet from a sheet supply device to the sheet receiving cylinder, including sheet carrying belts driven at a speed somewhat higher than the peripheral speed of the sheet receiving cylinder, other belts arranged to hold the sheets against the sheet carrying belts, and a continuously rotating support having stop members and moving at the same angular velocity as the sheet receiving cylinder and at a speed intermediate the speed

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of the sheet carrying belts and the speed of the sheet receiving cylinder.

17. In a sheet feeding mechanism for a printing machine having a sheet receiving cylinder with sheet registering stops, a continuously rotating sheet timing cylinder having sheet stops for engaging the leading edge of the sheet and moving at a slightly higher speed than the stops on the sheet receiving cylinder, sheet advancing means arranged to forward a sheet along a horizontal path from a sheet supply device to the sheet timing cylinder and press its leading edge against the stops thereon, and means for pressing the leading edges of the sheet against the stops on the sheet receiving cylinder and transferring the sheet thereto.

18. In a mechanism for feeding sheets to a machine having a sheet receiving cylinder rotated at constant speed and carrying grippers on its periphery to hold the leading edge of a sheet, a sheet timing cylinder slightly larger in diameter than the sheet receiving cylinder and rotated at a constant speed with the same angular velocity as the sheet receiving cylinder, and sheet stops on the periphery of the sheet timing cylinder posi-

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tioned to engage the leading edge of the sheet and to overtake the grippers during each revolution of the cylinders at a time when the stops and grippers are moving in adjacent paths and passing through a plane common to the axes of both cylinders.

19. In a mechanism for feeding sheets to a machine having a sheet receiving cylinder rotated at constant speed and carrying grippers on its periphery to hold the leading edge of a sheet, a sheet timing cylinder slightly larger in diameter than the sheet receiving cylinder and rotated at a constant speed with the same angular velocity as the sheet receiving cylinder, sheet stops on the periphery of the sheet timing cylinder positioned to engage the leading edge of the sheet and to overtake the grippers during each revolution of the cylinders at a time when the stops and grippers are moving in adjacent paths and passing through a plane common to the axes of both cylinders, means to forward the sheet to the sheet timing cylinder and press its leading edge against the stops and means to transfer the said leading edge from the timing cylinder to the grippers.

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