June 14, 1960 H. A. PRITCHARD 2,940,387

SHEET DELIVERY MEANS FOR ROTARY PRINTING PRESS

Filed Aug. 21, 1958 2 Sheets-Sheet 1

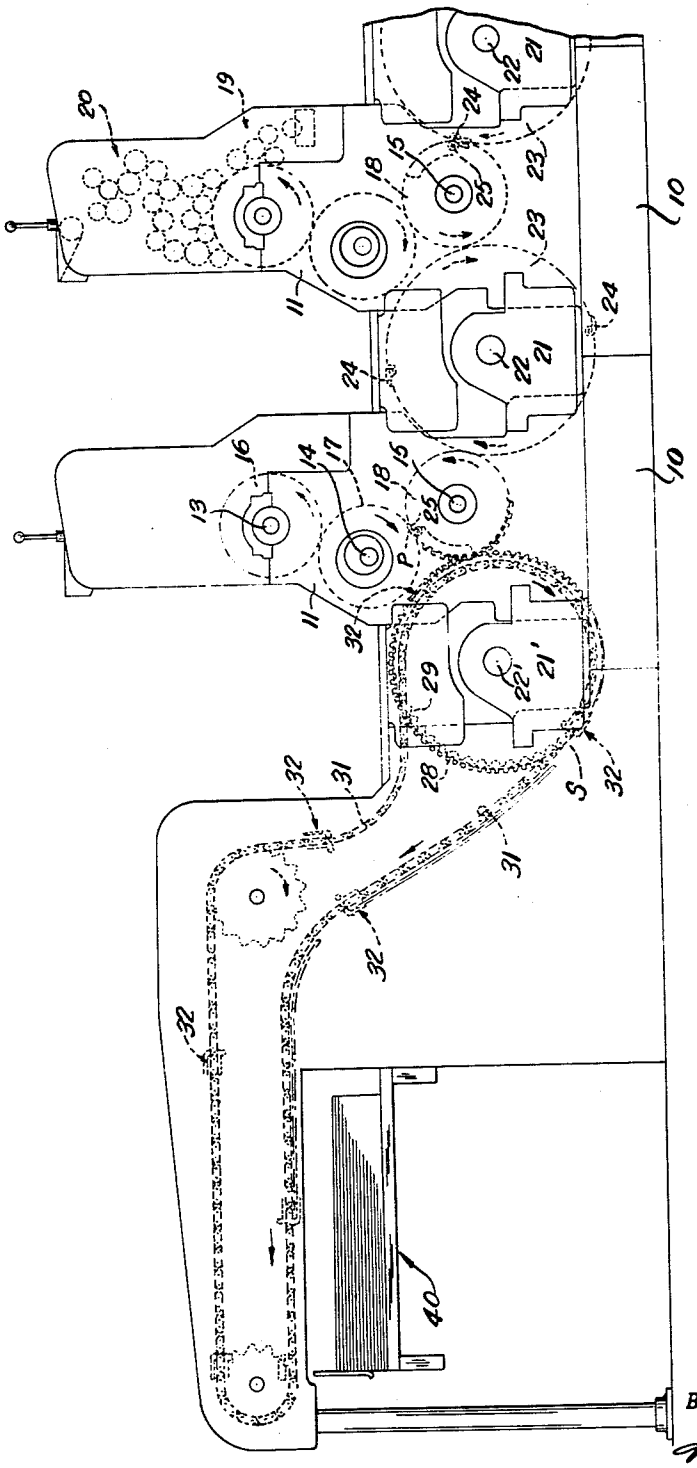

FIG. 1

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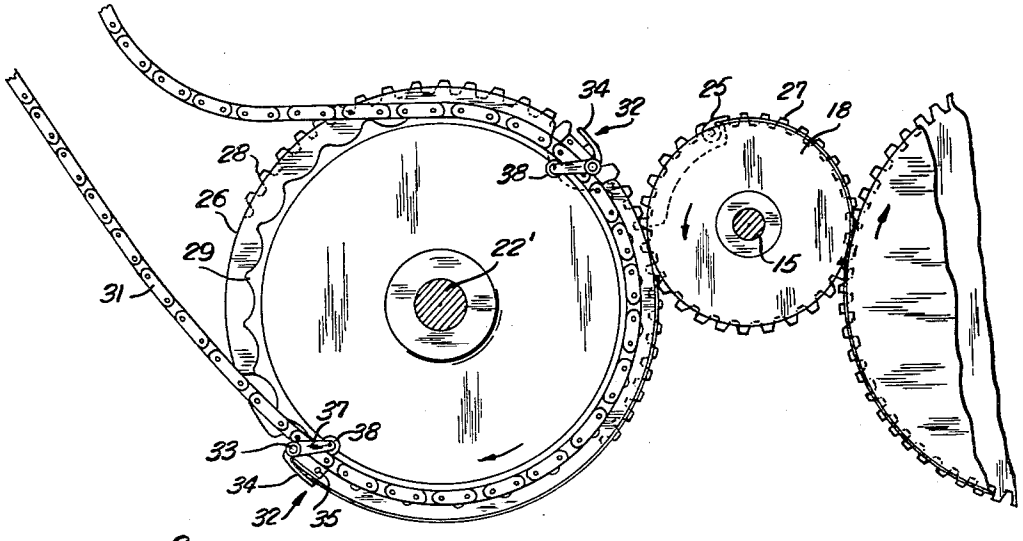

FIG. 2

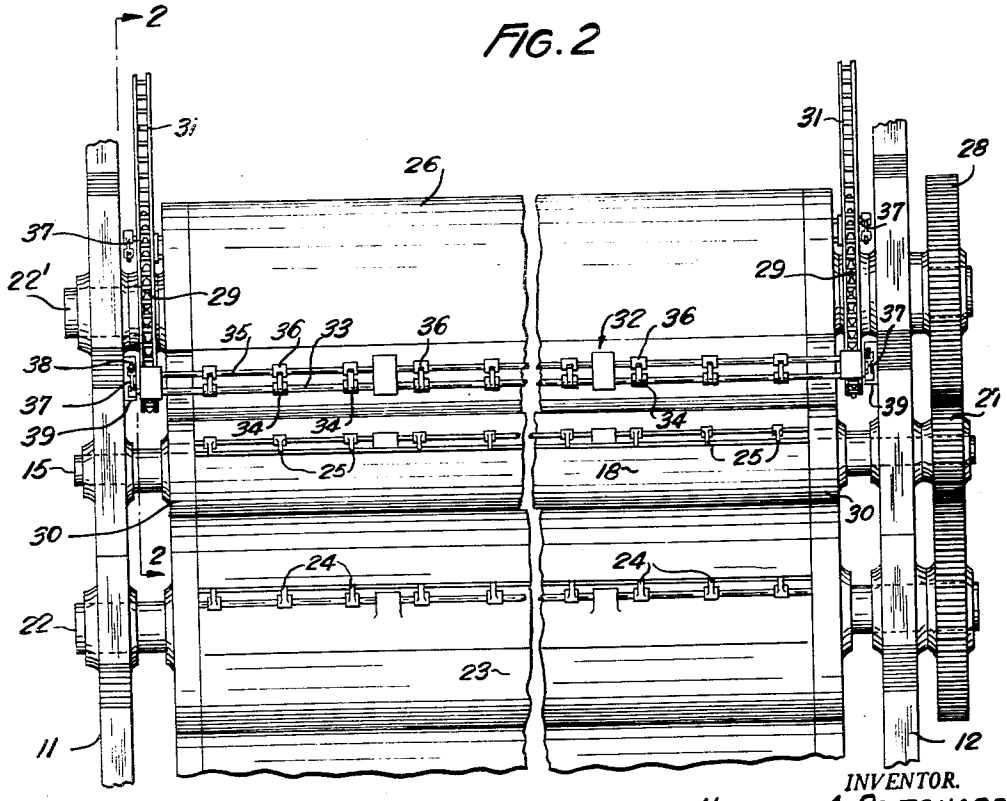

FIG. 3

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SHEET DELIVERY MEANS FOR ROTARY PRINTING PRESS

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7 Claims. (Cl. 101—183)

This invention relates to improvements in sheet delivery, i.e., delivery from a printing press or other high speed sheet handling machine. In particular it relates to delivery from printing presses in which a sheet is printed for each revolution of the impression cylinder of the press.

In sheet fed presses it is common to take the sheets from the impression cylinder, which may be the last impression cylinder in the case of a multi-unit press, by means of a chain conveyor equipped with gripper assemblies which grip each sheet as it leaves the impression cylinder and carry the forward end over a delivery pile support, the grippers being opened at the proper time to deposit the sheet on the pile.

The delivery conveyor may comprise a pair of sprockets over which the conveyor chains run, the arrangement being such that the gripper pads of the gripper assemblies move in a curved path that meets the surface of the impression cylinder. Heretofore the diameter of the delivery cylinder about which the gripper assemblies travel has been the same as the diameter of the impression cylinder and these cylinders have been rotated one to one.

In accordance with the present invention, the diameter of the delivery cylinder is double that of the impression cylinder. A number of important advantages result from that relation.

The printed side of the sheet is toward the delivery cylinder. When the latter cylinder is the same size as the impression cylinder, the distance between the point where the front edge of the sheet passes through the line of print and the point where the front edge of the sheet moves tangentially away from the delivery cylinder as the chains move away from their sprockets is relatively short as compared to the length of a full length sheet being printed. The gripping portions of the sheet grippers travel faster in the circular portion of their path about the delivery cylinder than after leaving the cylinder sprockets owing to the fact that pitch lines of the chain sprockets are smaller in diameter than the arcuate paths of the sheet gripping portions of the grippers and the sheet line. If this slower rate of travel begins before the rear edge of the sheet passes the line of print, the reduced speed of the front edge, unaccompanied by a reduction of speed of the trailing edge, may permit the rear portion of the sheet to cling to the ink on the printing cylinder somewhat past the line of print, thereby causing the sheet to move relative to the surface of the delivery cylinder, resulting in smudging of the printed image. If the delivery cylinder is positioned in a manner to avoid this effect the general design of the machine is unfavorably affected. Furthermore, if the sprockets are made so as to have the pitch line of the sprocket teeth coincident with the sheet gripping line established by gripper pads of the sheet grippers, the mountings for the gripper assemblies will of necessity have to be underslung with respect to the chains which carry them. This not only complicates the design considerably, but also adds to the expense of the entire mechanism.

In contrast, when the delivery cylinder is of a diameter twice that of the impression cylinders, as in the present invention, the difficulties experienced, as above noted, are avoided. Even though the sprockets may be made smaller in diameter than the surface of the delivery cylinder, the tail end of the sheet will still pass through the print line before the front end begins its travel on the straightaway because of the relatively long path around the double size delivery cylinder. Secondly, it is not necessary to resort to sprockets having a radius the same as that of the cylinder surface in order to avoid the speed change at the time the front edge of the sheet enters the straightaway, because with the larger size delivery cylinder the speed change will come after the tail end of the sheet passes the line of print.

One object of the invention, therefore, is the provision of a sheet delivery means wherein the delivery cylinder is twice the diameter of the impression cylinder, and a full-surface delivery cylinder is so constructed as to cause a minimum amount of offsetting and smudging of the printed side of the sheet which faces the cylinder.

Another object is the provision of a sheet delivery in which marking or smudging of the sheets resulting from the change of speed of the sheet as the forward edge thereof enters the straightaway of the conveyor, is avoided.

Another object is to provide a printing press delivery having an endless chain conveyor passing around a delivery cylinder of twice the diameter of the impression cylinder of the press, whereby the full length of the sheet travels at printing speed throughout the time that the sheet is being printed by the impression cylinder and its cooperating printing cylinder.

Another object is to permit the use of delivery cylinder sprockets of lesser diameter than the delivery cylinder diameter, without the position of the delivery cylinder about its impression cylinder being controlled by the length of the sheets, and without a change in speed between the leading and tail edges of the sheet while the sheet is undergoing printing.

An ancillary object is to permit use of such sprockets while still employing a cylinder having a full surface.

Still another object is the provision of a sheet delivery for a multicolor printing press having double size transfer cylinders in which the delivery cylinder is the same size as the transfer cylinders and may be mounted in the frame of the machine to bear the same relation to the last impression cylinder as each transfer cylinder bears to the preceding impression cylinder, thereby promoting efficiency and economy in construction.

Other objects and features of novelty will appear as I proceed with the description of that embodiment of the invention which, for the purposes of the present application, I have illustrated in the accompanying drawings, in which:

Fig. 1 is a side elevation of a multicolor offset printing press equipped with a sheet delivery constructed in accordance with the invention;

Fig. 2 is a fragmental, elevational view on a larger scale showing the delivery cylinder and chain conveyor, the view being taken substantially on the line 2—2 of Fig. 3; and

Fig. 3 is a fragmental plan view of the press, including the last transfer cylinder and last impression cylinder and the delivery cylinder with the chain conveyor running thereover.

In the Fig. 1 view of the machine there are shown two printing units. There may be further similar units up to the number of four or more. Each unit may have a base member 10 and side frame members 11 and 12

carrying bearings for shafts 13, 14 and 15 upon which are mounted plate, blanket and impression cylinders 16, 17 and 18 of conventional form, each of these cylinders being of the same size, as is the usual practice. Each unit is also provided with dampening means 19 and inking means 20 of conventional character.

Between the side frame members 11 and 12 of consecutive printing units there are positioned additional frame members 21 in which are carried bearings for shafts 22 that support transfer cylinders 23 of double the size of the impression cylinders 18. Each of the transfer cylinders 23 has two sets of diametrically oppositely positioned grippers 24. The grippers 24 are, of course, adapted to take sheets from one impression cylinder 18 and transfer them to the grippers 25 of the next impression cylinder. The shafts 22 of the various units are disposed in a common horizontal plane, and the same thing is true of the shafts 15 of the various impression cylinders. Preferably the plane of shafts 15 is somewhat above that of the shafts 22. The machine as thus far described is well known in the art.

The sheet delivery of the present invention departs from the conventional sheet delivery. It comprises in its preferred form frame members 21', similar in all essential respects to the frame members 21 for the transfer cylinders. These frame members 21' contain bearings for a shaft 22' that is similar to the shafts 22 and is in the same horizontal plane with shafts 22. The shaft 22' therefore bears the same relationship to the shaft 15 of the last impression cylinder as each shaft 22 of a transfer cylinder bears to the shaft 15 of the last preceding impression cylinder. The construction and erection of the complete machine is thereby simplified, and the cost maintained proportionately low.

On the shaft 22' there is mounted a delivery cylinder or drum 26, which may have a continuous surface rather than one made up of a series of disks with sharp teeth to be presented to the sheets, as is common where the delivery cylinder is of the same size as the impression cylinders. The drum 26 is, of course, keyed to the shaft 22'. It is driven by gear 27 on the last impression cylinder 18, the teeth of which mesh with the teeth of a gear 28 on the shaft 22'. On the shaft 22' there are also two sprockets 29 disposed laterally outward from the bearers 30 on the impression cylinder. Over these sprockets 29 there run two chains 31 constituting the side elements of an endless conveyor driven by the rotating sprockets 29. The chains run substantially horizontally over a delivery pile support 40 to deposit sheets thereon in the usual manner. Connecting the side chains 31 there are a series of gripper assemblies, generally designated 32, each assembly comprising a rod 33 carrying a series of grippers 34 and a rod 35 carrying a like number of gripper pads 36. Each rod 33 is rocked by an arm 37, the free end of which carries a small wheel or roller 38 that is adapted to engage a fixed cam 39, which controls opening and closing of the grippers 34. The cam 39 is, of course, so located as to enable each set of the delivery grippers 34 in turn to accept a sheet from the grippers 25 on the impression cylinder when the latter come into transferring position, that is, whenever they cross the plane connecting the two shafts 15 and 22'.

The line of print between the blanket and impression cylinders of the last unit is indicated at P in Fig. 1. The line at which the front edge of a sheet, after being imprinted, leaves the curved surface of the delivery cylinder and starts on what may be termed the straightaway of the conveyor, is indicated at S. The distance between these two points along the curved path which the sheet must travel is considerably greater than the length of a sheet which can be printed on the working surface of the impression cylinder 18. This insures that the tail end of the sheet will have passed through the line of print P considerably before the forward edge passes through the point S. Hence, although the travel of the forward edge will be slowing down somewhat as it leaves its curved path around the delivery cylinder, that condition comes too late to affect the printing, and no marking or smudging occurs.

Having thus described my invention, I claim:

1. In a sheet fed printing press, in combination, an impression cylinder having sheet grippers, a gap, and an impression surface adapted to handle a maximum length sheet to be printed by said press, a printing cylinder cooperating with the impression cylinder, an endless chain conveyor having a plurality of gripper assemblies carried thereby and adapted to receive sheets from the impression cylinder, a delivery pile support to which sheets are delivered by the conveyor from the impression cylinder, and a delivery cylinder with which the impression cylinder cooperates having sprockets around which the endless conveyor and its gripper assemblies travel, said delivery cylinder being of twice the diameter of the impression cylinder and the distance along the sheet path between the point at which the endless conveyor leaves the delivery cylinder and the line of print between the impression and printing cylinders being greater than the length of the maximum size sheet to be handled by the press, whereby the tail of a sheet will have passed the line of print before the gripper assembly holding its leading edge has left the delivery cylinder.

2. In a printing press, a printing unit embodying an impression cylinder adapted to receive a sheet for each revolution thereof and carry it through a printing station, and delivery means for receiving sheets from the impression cylinder comprising a sheet delivery cylinder in transferring relation with the impression cylinder and of a diameter which is a multiple of the diameter of said impression cylinder, sprockets turning with said delivery cylinder, an endless conveyor comprising chains running on said sprockets, and a plurality of gripper assemblies carried by said chains, said gripper assemblies being spaced apart a distance corresponding with the circumference of the impression cylinder and leaving said sprockets at a predetermined position to move the sheet from the delivery cylinder, the distance along the sheet path from the print line at said printing station to the point at which said gripper assemblies leave their sprockets being at least as great as the maximum size sheet to be handled by the press.

3. In a printing press, the structure as defined in claim 2 wherein said cylinder is a solid surface cylinder.

4. The invention set forth in claim 1 wherein the pitch line radius of the sprockets is less than the radius of the delivery cylinder.

5. In a sheet fed printing press, in combination, a plurality of same size impression cylinders each having a set of sheet grippers and a gap and adapted to receive sheets on an impression surface extending from the grippers around the cylinder to the gap, a transfer cylinder cooperating with and located between successive impression cylinders, said transfer cylinders being twice the diameter of the impression cylinders and each of said transfer cylinders having two sets of grippers spaced 180° apart thereon, a printing cylinder cooperating with each impression cylinder, and delivery means comprising an endless conveyor for taking sheets from the last impression cylinder and transferring them to a delivery pile support and further comprising a delivery cylinder of the same size as the transfer cylinders and having sprockets at its ends about which the endless conveyor travels, and said endless conveyor carrying gripper assemblies for receiving sheets from the last impression cylinder and conveying them forward at printing speed throughout the time that the sheets are being printed by the last impression cylinder, the distance along the sheet path between the point at which said endless conveyor leaves the delivery cylinder and the line of print between the last impression and printing cylinders being greater than the length of the maximum size sheet to be handled by the

press, whereby the tail of the sheet will have passed said line of print before the gripper assembly holding its leading edge has left the delivery cylinder.

6. The invention set forth in claim 5 wherein the delivery cylinder is disposed in the same relation to the last impression cylinder as each transfer cylinder is to its preceding impression cylinder.

7. The invention set forth in claim 5 wherein the axes of the transfer and delivery cylinders are all in the same horizontal plane and the distance between the delivery cylinder and the next adjacent transfer cylinder is equal to the distance between successive transfer cylinders, and wherein the axes of the impression cylinders are all located in a common horizontal plane.

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