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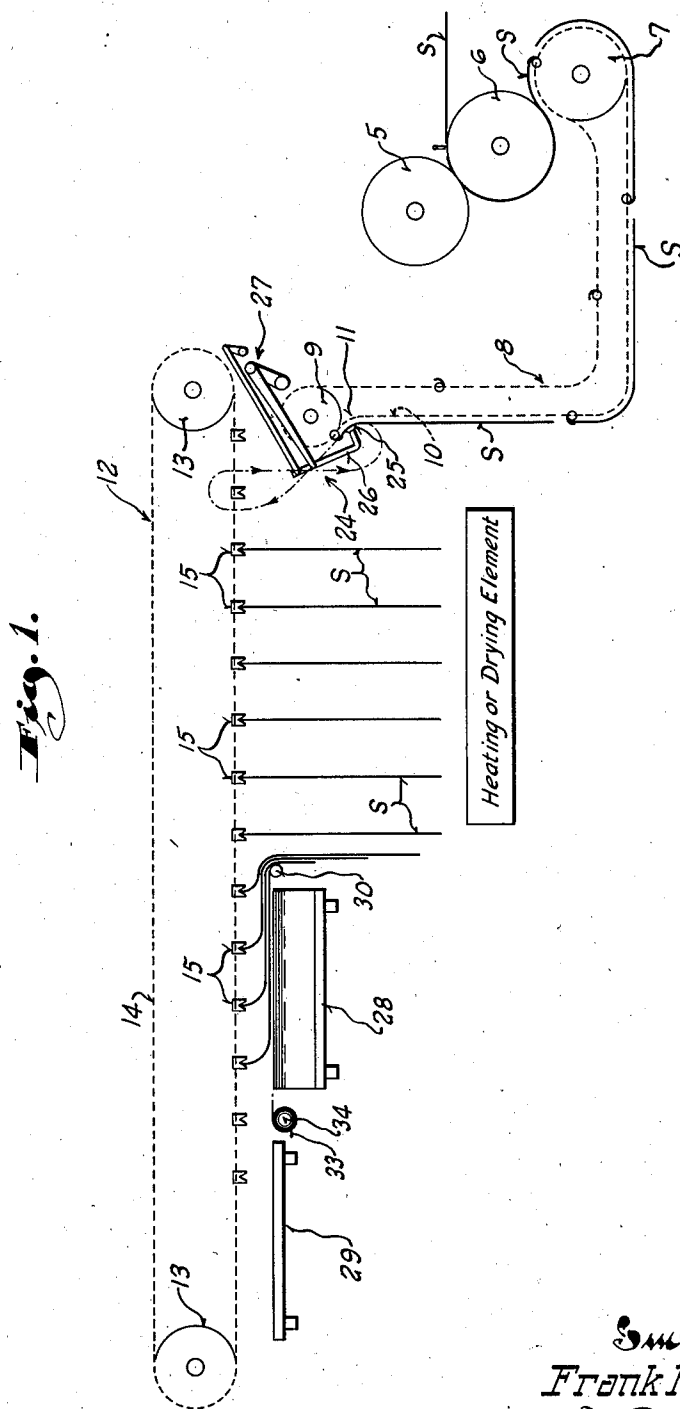
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SHEET DELIVERY MECHANISM

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3 Sheets-Sheet 1



Heating or Drying Element

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3 Sheets-Sheet 2



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SHEET DELIVERY MECHANISM

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This invention relates to sheet delivery mechanism for printing presses and kindred machines.

It is an object of this invention to provide a sheet delivery mechanism designed to receive sheets at press speeds and advance them slowly through a treatment zone to the point of final discharge.

In many classes of printed work the sheets must be kept separate for a period of time after they emerge from the press and it is for this type of work that the present invention is particularly designed. Through it the sheets are conveyed edgewise at the same linear speed as they move through the press to a slow moving conveyer which carries the sheets in a dependent or hanging position through a treatment zone which may be merely a heating or drying unit or through a properly air conditioned chamber to be disposed on a pile which constitutes the final delivery point.

Obviously the transfer of the sheets from a fast moving conveyer to a conveyer traveling at a much slower speed involves difficulties and it is therefore another object of this invention to provide a novel sheet transfer mechanism which has sheet gripping suckers or the like traveling in a path which meets and substantially coincides with a portion of the path of the sheets carried by the fast moving conveyer to take up the sheets therefrom and feed them edgewise into the bites of gripping devices on the slow moving conveyer.

In order to effect smooth transfer of the sheets it is another object of this invention to so guide the path of the sheets carried by the fast moving conveyer at the point they are taken over by the transfer suckers that at the instant of transfer the sheets are moving at a speed materially slower than press speed.

Another object of this invention is to provide means for switching the discharge of the sheets from one pile to another without necessitating stopping the delivery mechanism.

Another object of this invention is to provide a sheet gripper for chain conveyers which is particularly suitable for use in handling cardboard and relatively heavy paper where abrupt bends are to be avoided.

With the above and other objects in view, which will appear as the description proceeds, this invention resides in the novel construction, combination and arrangement of parts substantially as hereinafter described and more particularly defined by the appended claims, it being understood that such changes in the precise embodiment of the herein disclosed invention may be made as come within the scope of the claims.

The accompanying drawings illustrate one complete example of the physical embodiment of the invention constructed according to the best modes so far devised for the practical application of the principles thereof, and in which:

Figure 1 is a view in side elevation diagrammatically illustrating a sheet delivery mechanism embodying this invention;

Figure 2 is a view in side elevation on an enlarged scale showing the slow moving conveyer and part of the fast moving conveyer, and in which the opposite end portions of the slow moving conveyer are illustrated one above the other;

Figure 3 is a top plan view of the delivery mechanism;

Figure 4 is a detail cross-sectional view on the plane of line 4-4 in Figure 2 and;

Figure 5 is a detail side elevational view of a modified form of sheet gripper.

Referring now particularly to the accompanying drawings in which like numerals indicate like parts in the several views, the numeral 5 designates the plate cylinder of a printing press to which sheets are presented by an impression cylinder 6.

The printed sheets designated S are picked off the impression cylinder by grippers traveling around a delivery cylinder 7 to be carried from the press by a chain conveyer 8. This chain conveyer has the customary gripper bars mounted on roller chains suitably guided on tracks (not shown) and as will be readily apparent, travels at the same high speed as the press. The discharge run of the conveyer 8 extends vertically and passes over idler sprockets 9.

The upwardly moving stretch 10 of the fast moving conveyer 8 is so guided that its approach to the sprockets 9 is around a relatively sharp bend 11, with the path of the sheet engaging portions of the grippers swinging around the bend on a shorter radius than that of pitch line. As a consequence the travel of the sheets carried by the fast moving conveyer in their passage around the bend 11 is slower than press speed. The purpose of this reduction in sheet speed at this point will be brought out hereinafter.

The sprockets 9 which define the discharge end of the fast moving conveyer 8 are positioned adjacent to and directly under the receiving end of a horizontal slow moving conveyer indicated generally by the numeral 12. This conveyer comprises horizontally spaced sprockets 13 suitably driven and about which sprocket chains 14 are trained, each chain having sheet gripping devices 15 mounted thereon.

The conveyer 12 distinguishes from the conventional chain conveyer used in the printing and sheet handling art by its omission of gripper bars. Instead, as stated, each chain 14 has gripping devices 15 mounted directly thereon. Thus by adjusting the spacing between the chains it is possible to accommodate the conveyer to sheets of different widths.

For the average sized sheet two chains and the gripping devices carried thereby are adequate. For wider sheets, it may be preferable to add one or more conveyer chains with similar gripping devices.

The top and bottom stretches of the chains are suitably guided by tracks indicated generally by the numeral 16. These tracks may be supported in any suitable manner as by frame members 17 adapted to be moved laterally toward and from each other with a translating motion upon actuation of a pinion shaft 18 upon which pinions are secured to mesh with fixed rack bars 19.

It is to be understood however that the structure illustrated to effect lateral adjustment of the gripper chains 14 is but illustrative and that any suitable means may be employed therefor.

The gripping devices 15 each have fixed and movable jaws 20 and 21, respectively, and are so mounted on the chains that the bites of the jaws face downwardly in the lower stretch of the slow moving conveyer. The movable jaws are biased toward closed positions by springs 22.

For opening the jaws to release a sheet gripped thereby, the movable jaws have arms projecting therefrom on the outer ends of which cam engaging rollers 23 are mounted to engage appropriately placed sheet releasing cams.

The engagement of a sheet between a pair of jaws is effected by merely pushing the sheet edgewise therebetween. This is the function of a novel sheet transfer mechanism indicated generally by the numeral 24.

This sheet transfer mechanism takes the sheets from the fast moving conveyer at the bend 11 and lifts them into the bite of the adjacent set of sheet gripping devices 15, the functioning of the transfer mechanism 24 being so timed with the slow moving conveyer that a set of sheet gripping devices 15 is in position to receive the sheet as the transfer mechanism presents the same edgewise thereto.

The sheet transfer mechanism 24 consists essentially of two or more suckers or vacuum cups 25 on suitable tubular carriers 26 which in turn are carried by a lever mechanism indicated generally by the numeral 27.

The lever mechanism 27 is so designed and constructed that it imparts the proper motion to the suckers or vacuum cups 25 to cause them to meet and substantially follow the path of the sheets on the fast moving conveyer as the sheets swing around the bend 11, at which time the grippers carrying the sheets open and release the same to the suckers or vacuum cups. It is, of course, understood that suction is established at the suckers or vacuum cups in time to take hold of the sheets as they are released.

The sheets thus gripped by the suckers or vacuum cups are presented edgewise to the lower stretch of the slow moving conveyer 12; and as already noted, as each sheet is thus lifted, a set of gripping devices 15 is in position to receive it. The suckers or vacuum cups 25 merely slide the upper edge of the sheet into the bite of the gripping devices and thereafter release the sheet by cessation of suction.

While the motion imparted to the suckers or vacuum cups 25 may be along different paths, a figure eight motion is particularly well adapted for the purpose especially where the two conveyers are arranged at right angles to each other as in the construction shown. In this case the lower loop of the figure eight meets and substantially coincides with the path of the sheets as they travel around the bend 11. At this point the sheets travel slower than press speed which is desirable and assures smoother sheet transfer.

Also, as will be readily apparent, the transfer mechanism may be equipped with two sets of suckers or vacuum cups moving at half speed and set diagrammatically opposite in their figure eight orbit.

The sheets thus transferred to the gripping devices 15 move forwardly flatwise in a hanging or dependent position and as the gripping devices 15 can be located quite close to each other, it is apparent that the conveyer 12 can advance at a much slower rate of speed than the conveyer 8. Thus adequate treatment or drying of sheets can be effected with a relatively short stretch of conveyer.

Obviously the conveyer 12 may carry the sheets through a properly air-conditioned chamber or tunnel, or as indicated in Figure 1, it may be sufficient to merely carry the sheets across a heating or drying element. In any event, after the sheets have been carried through a treatment zone by the slow moving conveyer 12 they are dropped onto one of two platforms 28 or 29.

As the sheets approach the first platform 28 they are dragged over a cross shaft 30, and when they reach a position over the platform 28, the gripping devices 15 carrying them open and allow the sheets to drop to one platform or the pile thereon. Opening of the gripping devices is effected by the engagement of their rollers 23 with cams 31, one for each chain 14.

As is customary, the platform 28 is lowered as the sheets are piled thereon and when filled, the delivery of the sheets can be switched to the platform 29 without stopping the machine. To do this it is only necessary to move the cam 31 out of the path of the approaching rollers 23 and swing a similar cam 32 down into the path of the rollers 23.

It is also desirable during and after the switching of the delivery from the platform 28 to the platform 29 to support the sheets against dragging across the pile on the platform 28 and for this purpose a curtain 33 wound on a shade roller 34 is positioned between the two platforms. At the time the cam 31 is swung out of its operative position, the curtain is unwound and pulled across the pile on the platform 28.

Preferably the unwinding of the curtain 33 and the switching of the cams is accomplished by one mechanism. For instance, cable drums 35 on the cross shaft 30 may have cables 36 which are attached to the free edge of the curtain 33 wound thereon by revolving the cross shaft. Revolution of the cross shaft is effected by cranking a cam shaft 37 having a gear 38 fixed thereon. The gear 38 meshes with a pinion 39 on the cross shaft 30.

A cam 40 also fixed on the cam shaft 37 provides for switching the delivery from one platform to the other. To this end the cam 40 has a depression 41 in which a cam follower 42 is seated when the mechanism is set to deliver sheets onto the platform 28. Rotation of the cam 40 to lift the follower 42 out of the depression actu-

ates linkage 43 which connects the follower with the cams 31 and 32 to move the cams 31 out of the paths of the approaching rollers 23 and swing the cams 32 into the paths of the rollers 23 concomitantly with the first movement of the curtain across the pile on the platform 28.

Thus it will be seen that when a switch is made from one delivery point to the other, the first sheet not to be dropped onto the platform 28 will be supported by the curtain as it advances to its delivery position over the platform 28.

In the event the stock being handled is relatively stiff so that abrupt bending must be avoided, the gripping devices on the slow moving conveyer are preferably like that illustrated in Figure 5.

In this case, the fixed and movable jaws of the gripping devices are both mounted on a lever 44 pivotally connected to a support on the chain so that the entire gripping device may swing. A spring 45 normally holds the lever arm 44 in a position defined by a stop 46 and at which the bite of the jaws is properly positioned with relation to the transfer mechanism 24.

When the grippers arrive at the point at which the sheet carried thereby would be required to flex, a cam roller 47 on an arm of each lever 44 rides into a stationary cam 48 to swing the entire gripper in a rearward direction as clearly shown in Figure 5, thereby precluding sharp bending of the sheet carried thereby.

From the foregoing description, taken in connection with the accompanying drawings, it will be readily apparent to those skilled in this art, that this invention provides an exceedingly useful and simple sheet delivery mechanism for use in all instances where sheets must be slowly carried in a separated condition through a treatment zone before being delivered to a pile platform.

What I claim as my invention is:

1. In a sheet delivery mechanism, the combination of: a fast moving conveyer for carrying sheets individually from a printing machine or the like; a slow moving conveyer adapted to be fed by the fast moving conveyer; and means for transferring sheets from the fast moving conveyer to the slow moving conveyer comprising a sheet carrier, and means for moving the sheet carrier with a figure eight motion, the path of which meets the path of the sheets carried by the fast moving conveyer to take sheets therefrom and traverses the path of the slow moving conveyer to present sheets thereto.

2. In a sheet delivery mechanism, the combination of: a fast moving conveyer for carrying sheets from a printing machine or the like with the sheets moving in edgewise succession; a slow moving conveyer adapted to receive sheets from the fast moving conveyer and having sheet grippers arranged to carry sheets in a dependent manner so that the sheets carried thereby move flatwise; a transfer mechanism for transferring sheets from the fast moving conveyer into the bite of the grippers on the slow moving conveyer, said transfer mechanism being entirely separate from said conveyers and comprising a sheet carrier adapted to grasp a sheet and release the same under suitable control; and means for imparting a motion to the sheet carrier the path of which meets and substantially follows part of the path of sheets on the fast moving conveyer and crosses the path of the sheet grippers on the slow moving conveyer.

3. In a sheet delivery mechanism, the combi-

nation of: a fast moving conveyer adapted to receive sheets from a printing machine or the like and carry them edgewise away from the machine; a slow moving conveyer having sheet gripping devices adapted to grip sheets and carry them in a hanging position flatwise through a treatment zone to a point of discharge; and transfer mechanism movable along a figure eight path, one loop of which meets the path of the sheets carried by the fast moving conveyer and the other loop of which crosses the path of the advancing sheet gripping devices on the slow moving conveyer, to thereby pick up the sheets from the fast moving conveyer and carry them edgewise into the bite of the sheet gripping devices on the slow moving conveyer.

4. In a sheet delivery mechanism, the combination of: means for advancing sheets edgewise along a defined path; means for advancing sheets flatwise in a dependent position along a defined path, the paths of said two sheet advancing means being adjacent to each other at one point; and means for transferring sheets individually from the first mentioned sheet advancing means to the second mentioned sheet advancing means, said transferring means being entirely separate from the said two sheet advancing means and including a sheet gripping member movable with a defined path which meets and substantially coincides with a part of the first designated path of the sheets to take a sheet from the first designated sheet advancing means and crosses the second designated path of the sheets to present the sheet to the second designated sheet advancing means.

5. In a sheet delivery mechanism, the combination of: conveying means for advancing sheets edgewise along a defined path; conveying means for advancing sheets flatwise in a dependent position along a defined path at an angle to the first designated path, said two conveying means being so positioned relative to each other that the discharge end of the first mentioned conveying means is adjacent to the receiving end of the second mentioned conveying means; transfer means entirely separate from the two conveying means for carrying sheets from the discharge end of the first mentioned conveying means to the receiving end of the second mentioned conveying means including a sheet gripping member; and means imparting a recurrent motion to said sheet gripping member the path of which meets and substantially coincides with a portion of the path of the sheets carried by the first mentioned conveying means to take sheets therefrom and crosses the path of the second mentioned conveying means to present the sheets thereto.

6. In a sheet delivery mechanism, the combination of: an endless conveyer having a plurality of sheet gripping devices each of which comprises complementary jaws biased to a closed position and between which sheets may be inserted edgewise; means for feeding sheets edgewise into the bites of said gripping devices comprising vacuum cups, and means for imparting a recurrent feeding motion to said vacuum cups, the path of which approaches the path of the sheet gripping devices towards the mouths thereof, the motion of said vacuum cups being timed with the advance of the gripping devices so that sheets carried by the vacuum cups are inserted into the bite of the successive sheet gripping devices; and means for feeding sheets to said vacuum cups.

7. In a sheet delivering mechanism, the combination of: a sheet conveyer having a substantially horizontal run and having sheet gripping devices comprising complementary jaws biased to closed position but enabling edgewise insertion of sheets therebetween; the mouths of said jaws facing outwardly; a pair of sheet gripping suckers; means for imparting a recurrent motion to the suckers the path of which intersects the horizontal run of said conveyer and the sheet gripping devices carried thereby so that the sheets carried by the suckers are inserted edgewise into the bites of the gripping devices; and means for presenting sheets to said suckers.

8. In a sheet delivering mechanism, the combination of: a sheet conveyer having a substantially horizontal run and having sheet gripping devices comprising complementary jaws biased to closed position but enabling edgewise insertion of sheets therebetween, the mouths of said jaws facing outwardly; a pair of sheet gripping suckers; means for imparting a figure eight motion to the suckers, one loop of which intersects the horizontal run of said conveyer and the sheet gripping devices carried thereby so that sheets carried by the suckers are inserted edgewise into the bites of the gripping devices; and a fast moving sheet conveyer for carrying sheets edgewise to a point adjacent to the path of the suckers as they swing around the other loop of their figure eight motion to present the leading edge portions of sheets to said suckers.

9. In a sheet delivering mechanism, the combination of: a sheet conveyer having a substantially horizontal run and having sheet gripping devices comprising complementary jaws biased to closed position but enabling edgewise insertion of sheets therebetween, the mouths of said jaws facing outwardly; a pair of sheet gripping suckers; means for imparting a figure eight motion to the suckers, one loop of which intersects the horizontal run of said conveyer and the sheet gripping devices carried thereby so that sheets carried by the suckers are inserted edgewise into the bites of the gripping devices; a fast moving sheet conveyer for carrying sheets edgewise to a point adjacent to the path of the suckers as they swing around the other loop of their figure eight motion to present the leading edge portions of sheets to said suckers; and means for guiding said fast moving conveyer around a bend with the path of the sheets carried thereby swinging around a lesser radius than the pitch line of said conveyer and with the path of the sheets as they swing around said radius substantially congruous with the adjacent portion of the path of the suckers.

10. In a sheet delivery mechanism, the combination of: an endless conveyer having sheet gripping devices for carrying sheets in a dependent position with the sheets moving flatwise; a plurality of pile platforms successively traversed by said endless conveyer and upon which sheets advanced by said conveyer may be deposited; means for effecting release of sheets from the gripping devices of the endless conveyer in time to have the sheets carried thereby drop onto said platforms; and means for selectively rendering one or the other of said sheet releasing means operative while the delivery mechanism is in operation so that switching from one pile platform to the other does not necessitate shutting down the delivery mechanism.

11. In a sheet delivery mechanism, the com-

5 combination of: an endless conveyer having sheet gripping devices adapted to carry sheets in a dependent position for discharge onto one or the other of two pile platforms across which the endless conveyer travels, said gripping devices comprising complementary jaws biased to a closed sheet gripping position; two sheet releasing cams; means movable with the gripping devices and engageable with the cams for opening the jaws of the gripping devices to release the sheets carried thereby, one of said cams being in position to effect release of the sheets over each of the pile platforms; and means for simultaneously moving one of said cams into operative position and moving the other cam out of operative position so as to switch the delivery of sheets from one pile platform to the other.

12. In a sheet delivery mechanism, the combination of: one endless conveyer having sheet gripping devices adapted to carry sheets in a dependent position, said endless conveyer extending across two pile platforms positioned along the path of the conveyer; means for selectively effecting release of the sheets from the gripping devices for deposit onto one or the other of said two platforms; and means for supporting the sheets against dragging on the top of the pile on the first platform when the sheets are being delivered to the second platform.

13. In a sheet delivery mechanism, the combination of: an endless conveyer having sheet gripping devices adapted to carry sheets in a dependent position for deposit onto one or the other of two pile platforms positioned along the path of the conveyer; means for selectively effecting release of the sheets from the gripping devices for deposit onto one or the other of said two platforms; means for supporting the sheets against dragging on the top of the pile on the first platform when the sheets are being delivered to the second platform; and means for simultaneously rendering said sheet supporting means operative and switching the discharge of the sheets from the first to the second platform.

14. In a sheet delivery mechanism, the combination of: an endless conveyer for carrying sheets along a defined path for deposit onto one or the other of two pile supporting platforms positioned along the path of the conveyer; means adjacent to each platform for effecting release of the sheets from the conveyer for deposit upon the adjacent platform; means for selectively rendering one or the other of said releasing means operative to switch the discharge of sheets from one to the other of said platforms; and means rendered operative by the switching of the delivery from the first to the second platform to support the sheets against dragging across the top of the pile on the first platform.

15. In a sheet delivery mechanism, the combination of: an endless conveyer for carrying sheets along a defined path for deposit onto one or the other of two pile supporting platforms positioned along the path of the conveyer; means adjacent to each platform for effecting release of the sheets from the conveyer for deposit upon the adjacent platform; means for selectively rendering one or the other of said releasing means operative to switch the discharge of sheets from one to the other of said platforms; a curtain wound on a shade roller between the two platforms; and means for unwinding the curtain and stretching it across the pile on the first platform concomitantly with the switching of the delivery from the first to the second platform.

16. A sheet conveyer comprising: a pair of complementary sheet gripping jaws adapted to receive and grip a sheet therebetween; a supporting track; a carrier for said jaws movable along said supporting track; a part on which the jaws are mounted; means pivotally connecting said part to the carrier so that said part with the jaws thereon may swing; means for yieldingly holding said part in a predetermined position with relation to said carrier; and means for tilting said part and the jaws carried thereby out of their said predetermined positions as the carrier moves along said supporting track.

17. In a sheet conveyer: a supporting track; a carrier movable along said track; an arm pivotally connected to the carrier and depending therefrom; complementary jaws on said arm adapted to receive and grip a sheet therebetween; yieldable means normally holding said arm in a predetermined position with relation to the carrier; a cam in fixed position with relation to the track; and means on the arm arranged to ride onto said cam and deflect the arm and the gripping jaws out of their normal positions.

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