

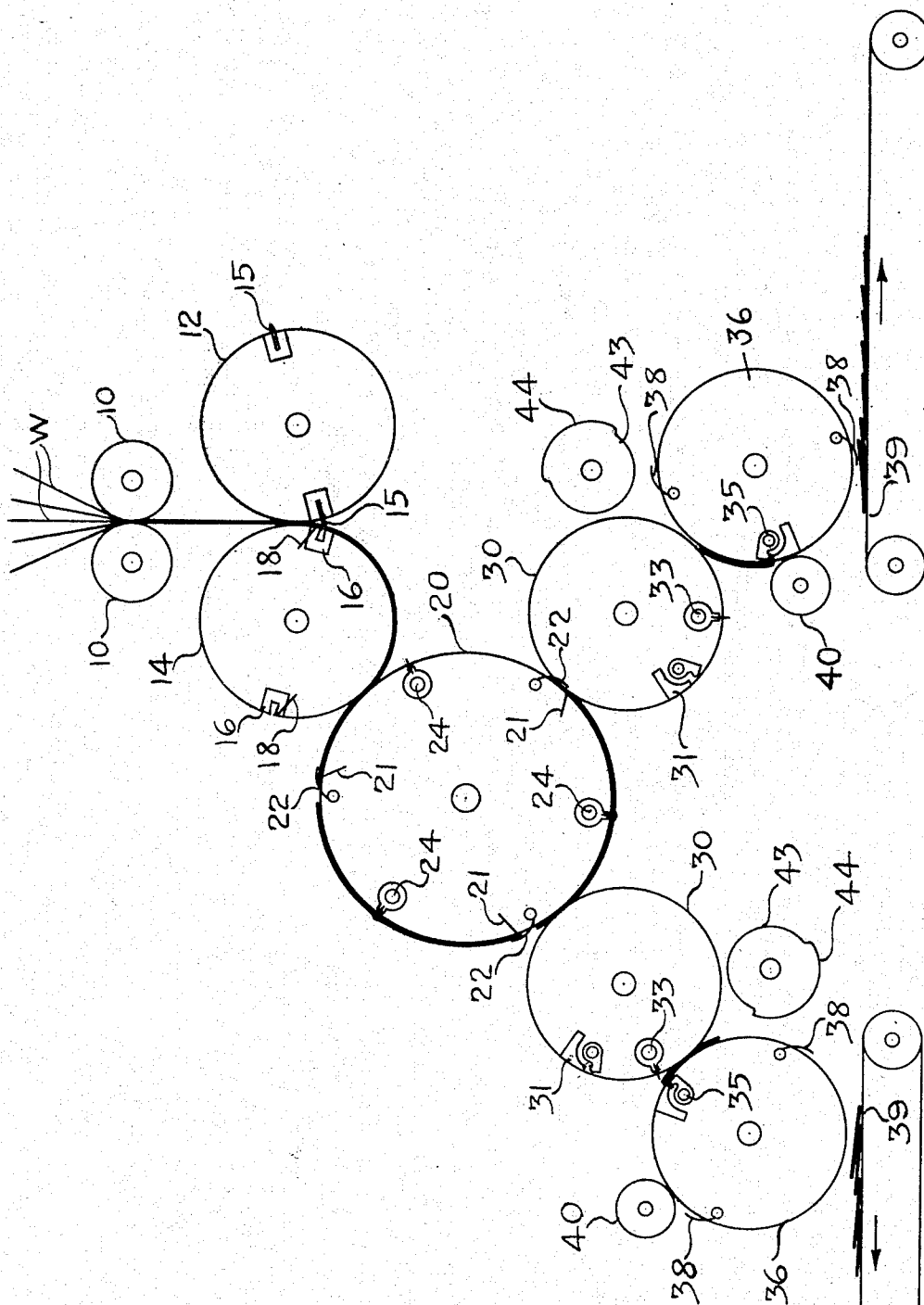
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FOLDING AND DELIVERY MECHANISM

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FOLDING AND DELIVERY MECHANISM

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The present invention relates to new and useful improvements in folding and delivery apparatus and more particularly to a novel and improved rotary folding and delivery mechanism particularly adapted for use with rotary printing presses.

Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, constructions, arrangements, combinations and improvements herein shown and described.

The accompanying drawing, referred to herein and constituting a part hereof, illustrates one embodiment of the invention, and together with the description, serves to explain the principles of the invention.

The single figure of the drawing is a diagrammatic view showing the relative position and co-operation of the various rotary cutting, folding, impaling, gripping and delivery elements of the present embodiment of the invention.

The present invention has for its object the provision of a novel and improved rotary cutting, folding and delivery mechanism which is capacitated to deliver alternatively a plurality of different kinds of products, and in which the change from one kind of product to another may be easily accomplished.

The invention further provides an improved rotary cutting, folding and delivering mechanism which is relatively simple in construction and which can produce products with one or two parallel folds, may collect or not as desired, and delivers these products satisfactorily at relatively high speeds.

In accordance with the illustrative embodiment of the invention, rotary means are provided for cutting one or more associated webs of paper into sheet lengths, which sheets are transferred to another cylinder which may collect a plurality of sheet lengths, and the single group of sheets or collected group of sheets are transferred to either or both of two jaw cylinders into the jaws of which the products may be folded, after which the products may again be folded into the jaw of another jaw cylinder and delivered, or alternatively the once folded product may be delivered without being folded by the second of the jaw cylinders. Slitting means may be provided to

slit the folded product into more than one section.

It will be understood that the foregoing general description and the following detailed description as well, are exemplary and explanatory of the invention but are not restrictive thereof.

Referring now in detail to the illustrative embodiment as shown in the accompanying drawing, a plurality of webs of paper W which may or may not be longitudinally folded are fed to the cutting, delivery and folding apparatus by means of nipping rolls 10 which press against the web and are driven at a surface speed the same as that of the normal web speed, and the associated webs W are thus fed to the cooperating cutting cylinders 12 and 14. The male cutting cylinder 12 is provided with diametrically opposed cutting knives 15, while the female cylinder 14, of the same diameter, is provided with diametrically opposed cutting blocks 16, and with cooperating impaling pins 18 which impale the leading end of the web and cause it to be carried around with the cylinder 14 until the leading end is transferred to the collecting cylinder.

Collecting cylinder 20 comprises a larger cylinder, which is conventionally one and one-half times the diameter of cylinders 12 and 14, and is provided with three sets of impaling pins 21, three sets of grippers 22, and three sets of spring-seated folding knives 24, the latter being a standard magazine type of folding blade, the folding knives being spaced a sheet length apart (equidistant from each other), as are the impaling pins 21 and grippers 22. The folding knives 24 are positioned substantially midway between the pairs of impaling pins and grippers so that the sheets will be folded centrally while they are held by the grippers 22, just after they have been released by the pins 21.

Cooperating with the collecting cylinder 20 are two jaw cylinders 30 of approximately printing cylinder size, each provided with one set of folding jaws 31 into which products may be folded by one of the blades 24, of the collecting cylinder 20. Each of the cylinders is also provided with an auxiliary removable spring-seated folding knife 33 to cooperate with a folding jaw 35 on delivery cylinder 36, one such delivery cylinder being provided for each of the jaw cylinders 30. Delivery cylinders 36 are also provided with a pair of diametrically opposed grippers 38 to take the products from the respective jaw cylinders 30 and deliver them to the slowly moving delivery belts 39, disposed immediately below.

A standard slitting disk 40 is provided running with each of the delivery cylinders 36, for slitting the two-page wide ribbons into single width ribbons before they are delivered on the slowly moving belts 39. The disk 40 may be optionally silenced so that products of varying width may be delivered. Relieved feed pulleys 43 are provided to operate in conjunction with the jaw cylinders 30 and operate at the same surface speed. Necessary gearing is provided between cylinders 30 and 36 to rotate cylinder 30 either one-to-one with cylinder 36 or can make two revolutions for each revolution of cylinder 36, the purpose of this differential speed ratio being described hereinafter. The surface speed of cylinders 12, 14, and 20 is exactly that of the web, there being a slight differential in surface speed between cylinders 30 and cylinder 20, this differential being necessary on account of the tuck and fold mechanism. The general construction of the jaws and folding knives, together with their timed relationship being shown in Patent #1,966,885 of July 17, 1934.

Conventional means are provided for operating the impaling pins 18 so as to impale the leading end of the web W just prior to the moment of cutting by the knife 15, and carry the web part way around cylinder 14 to a point approximately on the center line between cylinders 14 and 20, at which time impaling pins 21 take the leading edge of the web, while pins 18 are withdrawn. The web is thus transferred to cylinders 20, and at a point just past the tangent line between cylinders 14 and 20 the grippers 22 take the web, these grippers having previously been retired below the surface of the cylinder by the double motion which actuates them. Shortly after grippers 22 have gripped the web, impaling pins 21 are retracted below the cylinder surface. Grippers 22 carry the web around the cylinder 20 until it is folded off by the corresponding blade 24 into one or the other of the jaws 31 of cylinders 30. As is usual, suitable means are provided for actuating the spring-seated folding knives 24 so that they operate to fold all of the collected sheets into the jaw 31 of one of the cylinders 30, or to fold the uncollected sheets alternately first into the jaw 31 of one and then the other cylinder 30. The impaling pins 21 are similarly actuated so as to release the leading end of the sheets just prior to the moment of folding, and conventional means are employed for releasing the grippers 22 each time that the single or collected groups of sheets are to be folded from the cylinder 20, to either cylinder 30.

The entire mechanism is designed to deliver full size products with three sides open or half size products having two parallel folds. The sequence of operation when delivering straight run products having three sides open, is as follows:

Pins 18 in cylinder 14 impaling the leading edge of the webs just prior to cutting, carry the webs partially around to the point of tangency between cylinders 14 and 20, where impaling pins 21 of cylinder 20 engage the leading edge, while pins 18 are withdrawn, grippers 22 of cylinder 20 take the webs just past the tangent point and pins 21 are withdrawn.

Both jaw cylinders 30 are in operation but folding knives 33 have been removed. The sheet or web is carried around cylinder 20 until folding knife 24 comes into operation with folding jaw 31 of the first or left-hand jaw cylinder 30, at which point the fold in the first set of sheets is made by the action of the folding jaw taking

them from the folding knife, the grippers 22 then release the sheets.

The following series of sheets, which constitute the other half of the plate cylinders, are carried by cylinder 20 past the left-hand jaw cylinder 30 and are folded off into the right-hand cylinder 30. Each of the delivery cylinders 36 is, under these conditions, geared to operate at one-half the revolutions of their co-acting jaw cylinder 30, and jaws 35 of cylinders 36 are silenced while grippers 38 are timed to co-act with jaws 31. The folded sections are therefore carried around by the jaw cylinder 30 and transferred at their tangential point into the first of the delivery grippers 38, by means of which they are carried around and laid down on the slow down belt 39 at half speed.

Pulleys 43 are set to carry a pinch on the folded sheets between cylinders 30 and themselves, and since their surface speed is the same as the co-acting jaw cylinders, serve to feed the sheets ahead into the grippers at the time of transfer, since at this time, with the jaws open, the sheets would, without this pinch, be entirely free and would not properly transfer. As there are two sections around the plate cylinders and alternate deliveries, one left and one right, complete separation of the signatures is obtained, it being understood that since cylinders 36 rotate at half the revolutions of cylinders 30, delivery grippers 38 alternately accept sheets from their jaws 31.

As previously stated, the 2-page wide signatures can be slit into two 1-page wide signatures by means of slitter pulleys 40 before they are laid on the belts, or, if it is desired, by silencing slitter 40 the signatures can be delivered two deep. If the folder is run with 1-page wide ribbons only, it is not necessary to use the slitter.

The collect run for the same size signatures is made in the same manner, with the exception that either one of the jaw cylinders 30, together with its co-acting delivery cylinder 36, is silenced and is therefore inoperative, it being the usual custom to silence the pair of cylinders on the right side of the drawing. In this case, the first signature which is cut off and transferred to the collecting cylinder, is carried around by the pins and grippers in that cylinder past the first jaw cylinder 30, the pin and gripper release cams at this time being thrown out of action by the mechanism which operates it. The signature is therefore not folded off but is carried up to cutting cylinder 14 where, since the collecting cylinder is three pages around, the signature from the second half of the plate cylinder is superimposed onto the signature for the first half, with the impaling pins 21 moved out by means of their cam to a position where they will accept the sheets, and the grippers 22 having been retired so that they will pass cylinder 14. These grippers, in the manner previously described, then take the combined signatures, the impaling pins are withdrawn, and the two signatures carried around where they are folded in the single jaw 31 of the first cylinder 30, the grippers, being arranged to release at the proper time by means of their gripper operating cam. The collected signature is then transferred to delivery cylinder 36 and conveyor 39 as previously stated.

If it is desired to deliver products having two parallel folds on a straight run, the operation of the upper portion of the folder is the same as for the other size signature. In this case, however, folding knives 33 are installed in both of the jaw cylinders 30. Delivery cylinders 36 are

arranged, by their suitable gearing, to make one revolution for one revolution of the jaw cylinder and jaws 35 are properly timed in with folding knives 33. The signatures are thus transferred from the cutting to the collecting cylinder and folded into jaw cylinder 30 in the standard manner, but here, instead of being transferred at half speed to the grippers of cylinder 36, they are folded into jaw 35 of cylinder 36 at the full speed of the folder and are delivered on the belts at this speed. Since the signatures are only half size, no difficulty in delivering at this speed will be experienced. Slitter 40 can be used if necessary, or can be silenced. Feed pulleys 43 may be silenced and therefore inoperative, since the signatures are folded direct and not transferred into the grippers 38.

A collect run for this type of signature is made exactly the same as for the full size with the exception that the parallel fold, instead of the half speed transfer, is made between cylinders 30 and 36.

The mechanism of the present illustrative embodiment of the invention thus provides an easily convertible apparatus by which a group of sheets cut from one or more associated webs may be given one or two parallel folds, or two groups of cut sheets may be collected and given one or two parallel folds, and each of the once or twice folded, collected or non-collected products may be slit into a plurality of products if desired.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What I claim is:

1. A cutting, folding and delivery mechanism including in combination means for cutting sheet lengths from a running web, means for taking the cut sheets and selectively collecting and not collecting said sheets, means for folding the cut sheets and a delivery cylinder for delivering said folded sheets selectively operable to form and not to form a second parallel fold in the cut sheets, said delivery cylinder being rotatable at different speeds and having a folding jaw which may be rendered inoperative.

2. A cutting, folding and delivery mechanism including in combination a pair of cutting cylinders, a folding cylinder having sheet taking means selectively operable to collect and not to collect sheets, a pair of alternately operating jaw cylinders cooperating with the folding cylinder to receive folded sheets therefrom, one of which may be silenced, and a delivery cylinder for each jaw cylinder, each said jaw cylinder having a silencable folding blade which may operate to fold the folded sheets onto the delivery cylinder, said jaw cylinder being operable to transfer sheets to the delivery cylinder without folding when the jaw cylinder is operated at a higher speed than its delivery cylinder.

3. A cutting, folding and delivery mechanism including in combination a pair of cutting cylinders, a folding cylinder having sheet taking means, a pair of jaw cylinders cooperating with the folding cylinder to receive folded sheets therefrom and a delivery cylinder operable at different speeds for each jaw cylinder, each said jaw cylinder having a silencable folding blade which may operate to fold the folded sheets onto the delivery cylinder, said jaw cylinder being op-

erable to transfer sheets to the delivery cylinder without folding when the jaw cylinder is operated at a higher surface speed than its delivery cylinder.

4. A cutting, folding and delivery mechanism including in combination a pair of cutting cylinders, a folding cylinder having sheet taking means selectively operable to collect and not collect sheets, a jaw cylinder cooperating with the folding cylinder to receive folded sheets therefrom and a delivery cylinder operable at different speeds with the jaw cylinder, said jaw cylinder having a silencable folding blade which may operate to fold the folded sheets onto the delivery cylinder, said jaw cylinder being operable to transfer sheets to the delivery cylinder without folding when the jaw cylinder is operated at a higher surface speed than the delivery cylinder.

5. A cutting, folding and delivery mechanism including in combination a pair of cutting cylinders, a folding cylinder having sheet taking means, a jaw cylinder cooperating with the folding cylinder to receive folded sheets therefrom and a delivery cylinder operable at different speeds with the jaw cylinder, said jaw cylinder having a silencable folding blade which may operate to fold the folded sheets onto the delivery cylinder said jaw cylinder being operable to transfer sheets to the delivery cylinder without folding when the jaw cylinder is operated at a higher surface speed than the delivery cylinder.

6. A cutting, folding and delivery mechanism including in combination a pair of cutting cylinders, a folding cylinder having three folding blades, grippers and sets of pins selectively operable to fold and to collect and fold sheets cut by the cutting cylinder, a pair of jaw cylinders operable at substantially the same surface speed as the folding cylinder and having each a silencable folding blade which may operate to give a second fold to products folded to the jaw cylinder by the folding cylinder and a delivery cylinder selectively running with each jaw cylinder at substantially the same speed and one half the speed of the jaw cylinder to receive and deliver the once and twice folded sheets.

7. A cutting, folding and delivery mechanism including in combination a pair of cutting cylinders, a folding cylinder having folding blades, grippers and sets of pins to fold sheets cut by the cutting cylinder, a pair of jaw cylinders having a silencable folding blade which may operate to give a second fold to products folded to the jaw cylinder by the folding cylinder and a delivery cylinder running with each jaw cylinder to receive and deliver the once and twice folded sheets, said delivery cylinders being selectively operable at the same and half the surface speed of the respective jaw cylinders.

8. A cutting, folding and delivery mechanism including in combination a pair of cutting cylinders, a folding cylinder having folding blades, grippers and sets of pins to fold sheets cut by the cutting cylinder, a pair of jaw cylinders having a silencable folding blade which may operate to give a second fold to products folded to the jaw cylinder by the folding cylinder and a delivery cylinder running with each jaw cylinder to receive and deliver the once and twice folded sheets, said delivery cylinders being selectively operable at the same and half the surface speed of the delivery cylinder and a slitter running with the delivery cylinder for slitting a folded sheet into a plurality of products.

9. A cutting, folding and delivery mechanism

including in combination a folding cylinder, a delivery cylinder having a folding jaw and sheet taking devices, and a jaw cylinder, intermediate the folding cylinder and delivery cylinder, having a silencable blade said jaw cylinder being selectively operable to transfer once-folded sheets to the delivery cylinder and to give a second fold to the sheets and transfer them to the delivery cylinder said delivery cylinder being selectively rotatable at the same and at a lower surface speed than its jaw cylinder.

10. A cutting, folding and delivery mechanism including in combination a folding cylinder, a delivery cylinder having a folding jaw and sheet taking devices, and a jaw cylinder, intermediate the folding cylinder and delivery cylinder, said delivery cylinder being selectively operable at the same and at a lower surface speed than the jaw cylinder, means in the jaw and delivery cylinders for selectively transferring a folded signature from the jaw cylinder to the delivery cylinder and for giving a second fold to the once folded signature and transferring said signature from the jaw cylinder to the delivery cylinder.

11. A cutting, folding and delivery mechanism including in combination a pair of cutting cylinders, a folding cylinder having means selectively operable to collect and not to collect, a pair of jaw cylinders to receive and fold sheets from the collecting cylinder and a delivery cylinder for each jaw cylinder, said delivery cylinders being selectively rotatable at the same surface speed as the other cylinders and at a lower speed, each jaw cylinder having a silencable folding blade by which a second fold may be made in the sheets.

12. A cutting, folding and delivery mechanism including in combination a pair of cutting cylinders, a folding cylinder, a jaw cylinder to receive and fold sheets from the collecting cylinder and a delivery cylinder for the jaw cylinder, said delivery cylinder being selectively rotatable at the same surface speed as the other cylinders and at a lower speed, each jaw cylinder having a silencable folding blade by which a second fold may be made in the sheets.

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