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C. S. CRAFTS
ROTARY CUTTING MECHANISM

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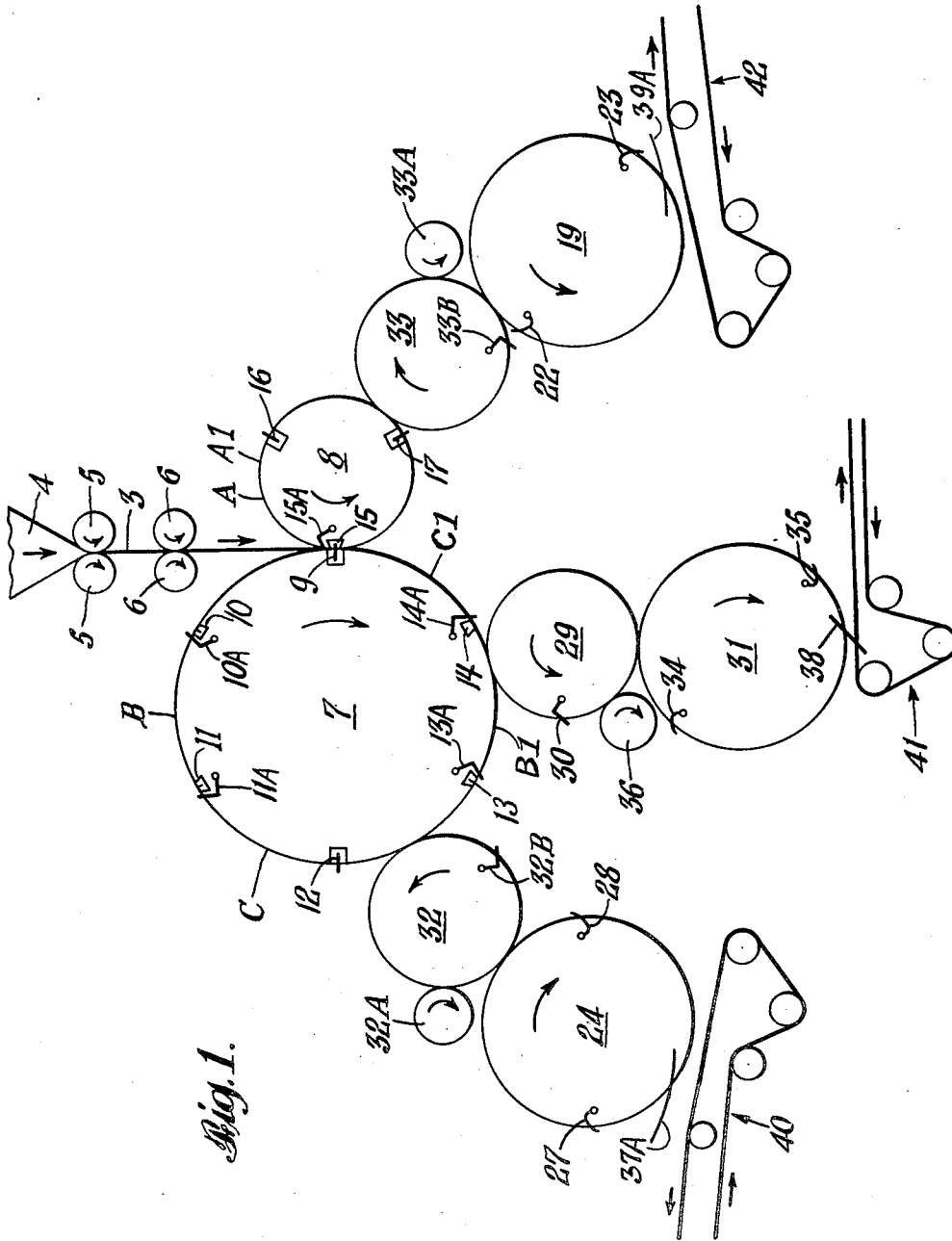


Fig. 1.

INVENTOR
CURTIS S. CRAFTS
BY
Robert D. Williams
ATTORNEY

March 7, 1950

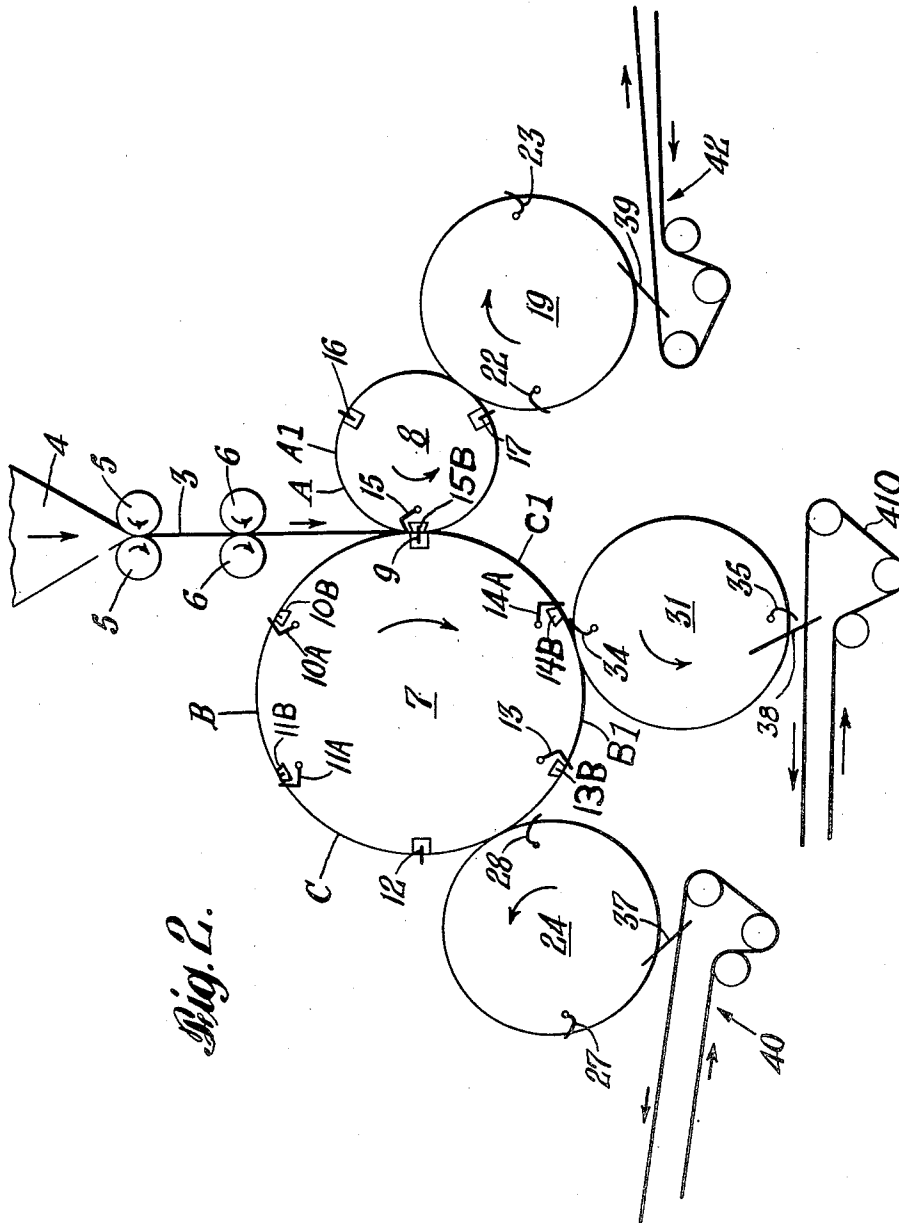
C. S. CRAFTS

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INVENTOR
CURTIS S. CRAFTS

BY: Robert D. Dunham
ATTORNEY

March 7, 1950

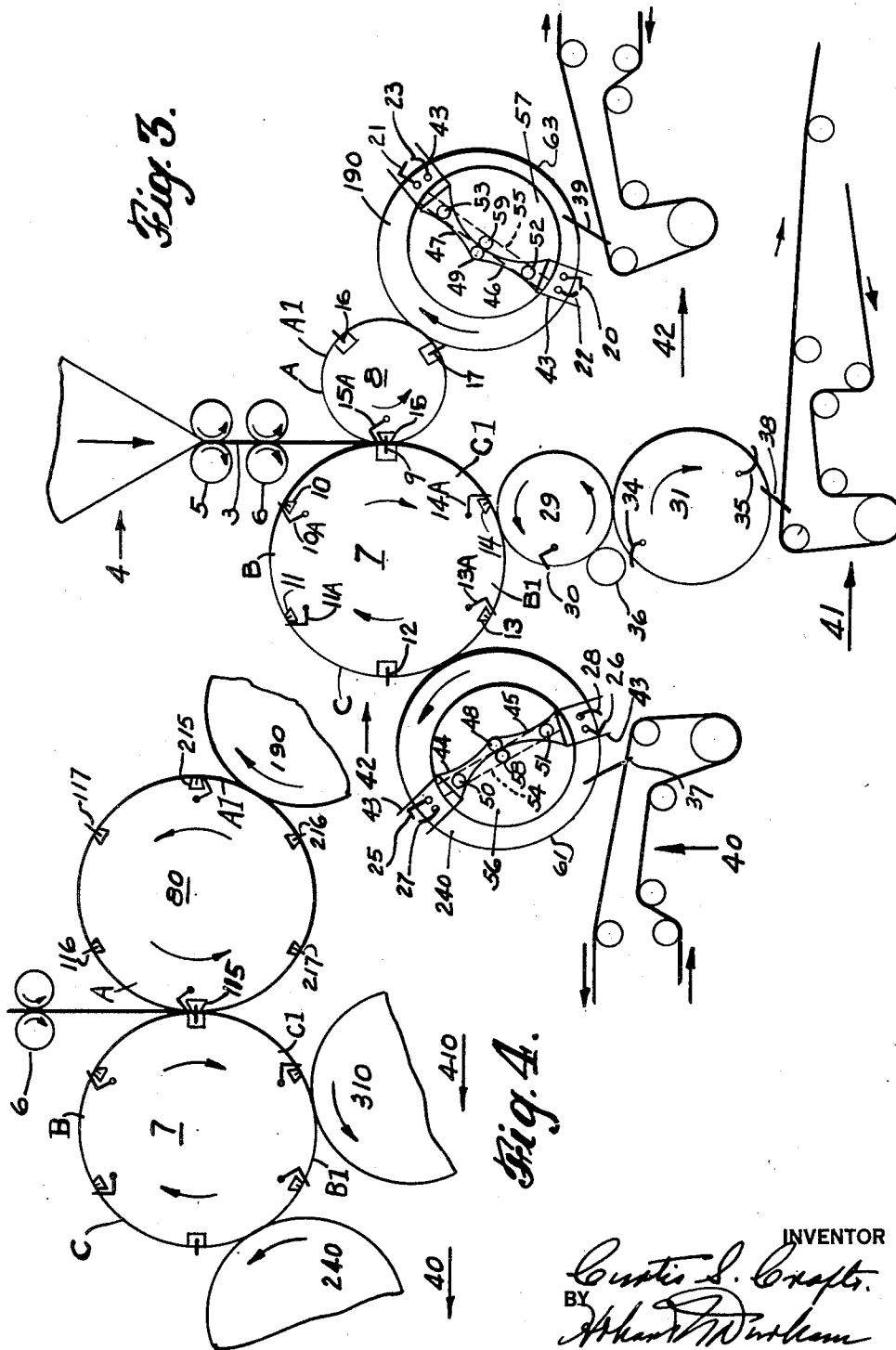
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UNITED STATES PATENT OFFICE

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ROTARY CUTTING MECHANISM

Curtis S. Crafts, Oak Park, Ill., assignor to The
Goss Printing Press Company, Chicago, Ill., a
corporation of Illinois

Application October 30, 1945, Serial No. 625,628

14 Claims. (Cl. 164—68)

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The present invention relates to a product separation system for use with high speed rotary printing presses and refers more particularly to a system for delivering three different products to their respective deliveries with simplicity of apparatus and with reliability.

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 drawings referred to herein and constituting a part hereof, illustrate three embodiments of the invention and together with the description, serve to explain the principles of the invention.

Of the drawings:

Figure 1 is a diagrammatic side elevation of a system embodying the invention;

Figure 2 is a diagrammatic side elevation of a modification of the same;

Figure 3 is a diagrammatic side elevation of another modification of the same, constituting the preferred embodiment, with certain constructional features illustrated; and

Figure 4 is a fragmentary diagrammatic side elevation of a modification usable with any of the above embodiments.

The present invention has for its object the provision of a mechanism for cutting and separating a printed and folded web into three parts, with a separate delivery for each part.

A further object is to effect such separation using fewer cylinders than would be used if all the products left the cutting cylinders in one direction and were thereafter slowed down by transfer cylinders and delivery cylinders.

A further object is that the cutting cylinders of the separation system shall retain their cutting abutments intact, rather than having the latter notched to receive the grippers of the transfer cylinders as in current practice.

A further object is to obviate the interference of the tail end of a slowed down product with the front end of an immediately adjacent product following at full speed.

In accordance with the illustrative embodiment of the present invention there are provided two cutting cylinders, one with a multiple of three parts around, the second with three parts around

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or a multiple thereof, the parts of each three part group or cycle on both cylinders being divided two and one as to the presence or absence of sheet holding means associated therewith, whereby a cut product may be held on the respective cutting cylinder and transported part way therearound to a transfer point. It is preferred, but not essential, that the holding means, preferably pins, be located adjacent the cutting abutments, and they have been so illustrated throughout the drawings. The parts of each cycle with which the sheet holding means are associated or adjacent which said means are located are thus constituted sheet holding parts, while the other parts are non-holding parts.

Three delivery cylinders are arranged to deliver the products of the two cutting cylinders, two of the three delivering the products from the larger of the cutting cylinders. The products are delivered to three belts which convey them away in any convenient direction or directions.

The above arrangement posed the problem that in transferring sheets from the larger cutting cylinder, if a sheet were transferred at a slowed down speed its tail would interfere with the head of the sheet immediately behind it on the cutting cylinder and still travelling at web speed. Pin transfer cylinders revolving at web speed were therefore interposed between the cutting and delivery cylinders.

A second form of the invention eliminates the pin transfer cylinders by timing the three delivery cylinders so that the middle one allows the first of two adjacent products on the large cutting cylinder to pass and takes the second, the first product then being taken by the outer delivery cylinder. This form requires that the points of transfer from the large cutting cylinder be separated peripherally of it by more than a sheet length, and permits transfer at a slowdown speed because no product at the transfer point is being immediately followed by another.

A third form of the invention was devised to meet the problem peculiar to the second form, that a slowdown transfer required grippers to be used as sheet taking means, which in turn required that the cutting abutments of the cutting cylinders be recessed to receive the grippers and the portions of the web overlying the recesses would be chewed instead of cut cleanly by the knives. The third form transfers and delivers the sheets by means of a variable speed or cyclical pin and gripper cylinder which takes the sheets at web speed and delivers them at reduced speed. This cylinder is more fully described in my co-

pending application for patent, Serial No. 625,627, filed October 30, 1945. This form severs the sheets cleanly and delivers three separate products while utilizing a minimum number of cylinders and permitting a choice of transfer sequence.

All forms of the invention share the feature that as the web is cut, the products resulting from each three part cycle of the cutting cylinders are transported from the cutting nip in opposite directions by the cutting cylinders, a single product being transported out of the cutting nip in one direction while two other products take the opposite direction, being subsequently separated and conveyed away in any convenient direction or directions. The word "direction" as here used means broadly "right" or "left" as viewed in the drawings with reference to the point of the most recent separation, rather than a more exact angular value.

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 of the invention as shown in Figure 1, the web 3 is drawn down off the former 4, between rolls 5 and nip rolls 6 to the nip of the two cutting cylinders 7 and 8. Cylinder 7 has two three-part cycles of knives and cutting abutments, namely the cycle of knife or saw 9 and cutting abutments or supports 10 and 11 and the identical cycle of knife 12 and cutting abutments 13 and 14. Cylinder 8 has one three part cycle of one cutting abutment 15 and two knives or saws 16 and 17, the succession of the parts thereof being complementary to that of the parts of cylinder 7. Adjacent each of all the above mentioned cutting abutments in known manner is a pin 10A, 11A, 13A, 14A and 15A. The knives and cutting abutments are thus adapted to come opposite each other in the cutting nip in operative relationship. The cutting cylinders 7 and 8 are also obviously effective to transport the recently severed products out of the cutting nip in one direction or the other as hereinafter more fully described.

Slowdown delivery cylinder 19 comprising grippers 22, 23 is disposed outwardly of cutting cylinder 8; slowdown delivery cylinder 24 comprising grippers 27, 28 is disposed outwardly of cutting cylinder 7; and substantially midway between cylinders 19 and 24 and below and in operative relationship to cylinder 7 is located slowdown delivery cylinder 31 comprising grippers 34, 35. Between the delivery cylinders and their respective cutting cylinders are operatively disposed pin transfer cylinders 32, 29 and 33 with their timed feed pulleys 32A, 36 and 33A, and pins 32B, 30 and 33B. The details of the stripper shoes 37A, 38, 39A and deliveries 40, 41, 42 form no part of the invention.

In operation, product *a* is held on cylinder 8 by pin 15A, cut from the web 3 by knife 16 and is then carried around to cylinder 33 which is revolving at web speed, the pin 33B takes the product and transfers it to delivery cylinder 19 revolving at two-thirds of web speed, the grippers 22 or 23 holding the product on for half a revolution and discharging it onto delivery 42 with the aid of stripper shoe 39A.

Product B is severed from web 3 by knife 17 and retained on cylinder 7 by pin 10A until it reaches pin transfer cylinder 29 whereupon pin 30 takes it and transfers it at web speed to delivery cylinder 31 which revolves at two-thirds

of web speed. The product is stripped from the cylinder by stripper shoe 38 and conveyed away by delivery 41.

Product C is severed from web 3 by knife 12 and retained on cylinder 7 by pin 11A until it is taken therefrom by pin 32B of cylinder 32 and delivered via delivery cylinder 24 and stripper shoe 37A to delivery 40.

The courses of products A1, B1 and C1 will correspond to those products A, B and C respectively, it being understood that product A1 is transferred by cylinder 8 on the revolution successive to the one which transferred product A.

The above system accomplishes the separate delivery of three different products through the use of three part cycles on the cutting cylinders, each cycle comprising at least one part having sheet holding means associated therewith and at least one other part not having such means, and arranging the delivery cylinders arcuately about the cutting cylinders, one delivery cylinder taking from one cutting cylinder and two delivery cylinders taking from the other and larger cutting cylinder. It does, however, involve numerous cylinders and the delivery of the products from delivery cylinders 24 and 19 to the deliveries 40 and 42 respectively may be called reverse delivery in that the product continues in substantially the same direction on the delivery as it had on the delivery cylinder at the point of delivery, instead of being reversed in direction as from cylinder 31 to delivery 41, which is a conventional magazine delivery.

In order to decrease the number of necessary cylinders the second form, illustrated in Figure 2, was evolved. In this form the pin transfer cylinders 32, 29 and 33 are omitted and slowdown delivery cylinders 24, 31, 19 take directly from their respective cutting cylinders. In order to permit taking directly from the cutting cylinder at reduced speed the sequence of taking was modified, product A going from cylinder 8 to 19 to delivery 42 as before, product B passing cylinder 31 which takes product C, product B then being taken by cylinder 24. As the transfer points of products B and C are separated peripherally of cylinder 7 by more than a sheet length, the tail of product B cannot interfere with the head of product C even though the former is slowed down while the latter is still travelling at web speed on cylinder 7. Conventional delivery is obtained throughout this figure, delivery 410 operating in the same direction as delivery 40. In addition to allowing no choice in the sequence of transfer to cylinders 24 and 31, this arrangement has a more serious disadvantage in that the cutting abutments 10B, 11B, 13B, 14B and 15B of cylinders 7 and 8 must be notched or recessed in order to receive the grippers 22, 23, 27, 28, 34 and 35, and as a result the portions of the web 3 overlying the points of notching or recessing may be merely chewed by the knives instead of being cleanly cut.

The preferred form of Figure 3 was therefore developed, utilizing the variable speed or cyclical pin and gripper delivery cylinders previously referred to as the outside or end cylinders of the three delivery cylinders. The mechanism of Figure 3 is similar to that of Figure 1 in that the cutting cylinders 7, 8 comprise the unrelieved cutting abutments 10, 11, 13, 14 and 15 and that cylinders 29 and 31 are located and operative as in Figure 1. Cyclical cylinder 240 replaces cylinders 24 and 32 for delivering from cylinder 7 to delivery 40, and cyclical cylinder 190 replaces

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cylinders 19 and 33 for delivering from cylinder 8 to delivery 42. The cylinders 240, 190 comprise pins 25, 26, 20, 21 and grippers 27, 28, 22, 23 carried in pin and gripper boxes 43 at the outer ends of arms 44, 45, 46, 47 and corresponding arms at the far end of the cylinders and not shown. The arms 44, 45, 46, 47 are individually pivotally mounted for rotation about the axes 48, 49 of their respective cylinders 240, 190 and comprise studs 50, 51, 52, 53 slidably engaging slots 54, 55 formed in drive wheels 56, 57 whose axes 58, 59 are displaced from the cylinder axes 48, 49 in a direction opposite from the cutting cylinders 7, 8. The drive wheels 56, 57 are connected to the press drive by means not shown.

Referring to cylinder 240 for example, it is evident that upon drive wheel 56 being driven counter-clockwise at a constant angular velocity by the press drive mechanism, a counter-clockwise rotation of irregular cyclical, angular velocity will be imparted to the arms 44, 45 by reason of engagement of their studs 50, 51 in slot 54. Half a revolution of wheel 56 from the position illustrated will cause arm 44 to travel 150° around axis 48 to the illustrated position of arm 45 and simultaneously will cause arm 45 to travel 210° around axis 48 to the illustrated position of arm 44. Each arm will be travelling fastest at the point of tangency between the respective cylinders, and will be travelling slowest at point 61 which is diametrically opposite. Similar fast and slow points are located on the periphery of cylinder 190. The cylinders 240, 190 are thus adapted to take sheets from the cutting cylinders at web speed and deliver them at reduced speed. It is to be understood that the taking of sheets or products at web speed and delivering them at reduced speed, featured in this preferred form of the invention, is not to be limited by the particular mechanism shown as accomplishing the purpose, such mechanism being the subject of a separate invention as noted above. As mentioned in connection with Figures 1 and 2, taking sheets at web speed may be done by pins and thus the cutting abutments may be constructed in continuous form to present surfaces against which the knives will cut cleanly. It will further be noted that conventional delivery utilizing stripper shoes 37, 38, 39 is obtained throughout Figure 3.

In Figure 4 cutting cylinder 80, comprising two three part cycles of abutments 115, 215 and knives 116, 117, 216, 217, replaces cylinder 8 and is correspondingly adapted to cooperate with the two abutment, one knife cycles of cylinder 7 to cut the web and transfer the cut sheets.

The remaining mechanism of Figure 4 may be that of any of the preceding figures, but as shown it is the mechanism of Figure 3 with cyclical cylinder 310 replacing cylinders 29 and 31, and delivery 410 conveying away products in a direction opposite that of delivery 41 in order to preserve conventional delivery from cylinder 310.

The advantage of a separation system providing a separate delivery for each of three products of a printing press can best be set forth by comparison with conventional mechanism. Presses are in existence with three parts around printing cylinders and two deliveries. Such a press must be run "three up" to yield one variety of product as products from all the parts are delivered to each delivery. Similarly, a press with six parts around printing cylinders and two deliveries must be run three up and would only yield two products. By the means of the present invention presses with cylinders either three, six or nine

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parts around can be used to produce either one, two or three products.

Throughout the claims the words "cutting means" shall be understood to refer to the positive or primary cutting member such as a knife, serrated blade or the like, to the exclusion of the cutting abutments or sheet supports, which are considered as secondary or reaction members against which the cutting members operate. The knives or saws and abutments or supports are each considered to be cutting parts cooperating in the operation of cutting the web.

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 is claimed is:

1. In a delivery for folded and printed products, in combination, a pair of cutting cylinders, one of said cylinders having two cutting means and four sheet holding means, the other of said cylinders having two cutting means and one sheet holding means, a delivery cylinder to receive products from said other cutting cylinder, and two delivery cylinders to receive products from said first cutting cylinder.

2. In a delivery for folded and printed products, in combination, a pair of cutting cylinders, one of said cylinders having two cutting means and four sheet holding means, the other of said cylinders having two cutting means and one sheet holding means, a slowdown delivery cylinder to receive products from said other cutting cylinder, and two slowdown delivery cylinders to receive products from said first cutting cylinder.

3. In a delivery for folded and printed products, in combination, a pair of cutting cylinders, one of said cylinders having two cutting means and four sheet holding means, the other of said cylinders having two cutting means and one sheet holding means, a slowdown delivery cylinder to receive products from said other cutting cylinder, two slowdown delivery cylinders to receive products from said first cutting cylinder and a web speed transfer cylinder interposed in operative relation between said first cutting cylinder and one of said slowdown delivery cylinders.

4. In a delivery for folded and printed products, the combination of a pair of cutting cylinders in cooperative relationship, one of said cylinders having twice as many cutting means as sheet holding means, the other of said cylinders having twice as many sheet holding means as cutting means, with three delivery cylinders, said delivery cylinders being disposed arcuately about said cutting cylinders, two of said delivery cylinders being capacitated to receive products from said other cutting cylinder, one of said delivery cylinders being capacitated to receive products from said first-mentioned cutting cylinder.

5. In a delivery for folded and printed products, the combination of a pair of cutting cylinders in cooperative relationship, one of said cylinders having twice as many cutting means as sheet holding means, the other of said cylinders having twice as many sheet holding means as cutting means, with three delivery cylinders, one of said delivery cylinders being disposed outwardly of said first-mentioned cutting cylinder, another of said delivery cylinders being located outward of said other cutting cylinder, the third of said delivery cylinders being located below said other

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cutting cylinder and substantially midway between said other delivery cylinders.

6. In a delivery system according to claim 5, a pin transfer cylinder operatively located between said other cutting cylinder and said third delivery cylinder.

7. In a delivery for folded and printed products, in combination, a pair of cutting cylinders, one of said cylinders having two cutting means and four sheet holding means, the other if said cylinders having two cutting means and one sheet holding means, a delivery cylinder to receive products directly from said other cutting cylinder, and two delivery cylinders to receive products directly from said first cutting cylinder.

8. In a delivery for folded and printed products, in combination a pair of cutting cylinders, each having its surface divided into a plurality of sheet lengths which plurality is a multiple of three, each of said cylinders being provided with sheet cutting means and with sheet holding means, the sheet cutting means on one cylinder being followed by two sheet holding means on the same cylinder and the sheet holding means on the other cylinder being followed by two sheet cutting means on said other cylinder whereby the sheet holding means on each cylinder are positioned to cooperate with sheet cutting means on the opposite cylinder and three delivery cylinders, one receiving sheets from the sheet holding means on one cutting cylinder and the other two receiving sheets from the sheet holding means on the other cutting cylinder.

9. A delivery for folded and printed products as claimed in claim 8 in which one of the cutting cylinders is twice the diameter of the other.

10. A delivery for molded and printed prod-

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ucts as claimed in claim 9 in which the delivery cylinders cooperating with the larger cutting cylinder are spaced more than a sheet length apart as measured on the surface of the cutting cylinder.

11. A delivery for folded and printed products as claimed in claim 9 in which the delivery cylinder operating with the smaller cutting cylinder receives its sheets from a transfer cylinder operating between the cutting cylinder and corresponding delivery cylinder.

12. A delivery for folded and printed products as claimed in claim 10 in which one of the cutting cylinders is twice the diameter of the other.

13. A delivery for folded and printed products as claimed in claim 10 in which the delivery cylinders operate at a slower surface speed than the cutting cylinder.

14. A delivery for folded and printed products as claimed in claim 12 in which the delivery cylinders operate at a slower surface speed than the cutting cylinder.

CURTIS S. CRAFTS.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

30	Number	Name	Date
	650,542	North	May 29, 1900
	2,022,688	Quick et al.	Dec. 3, 1935
	2,211,046	Barber	Aug. 13, 1940
	2,222,279	Barber	Nov. 19, 1940
35	2,248,016	Zuckerman	July 1, 1941
	2,353,445	Crafts	July 11, 1944