Nov. 8, 1949 A. M. ZUCKERMAN 2,487,404

MECHANISM FOR MULTIFOLDING PRINTED WEBS

Filed May 10, 1945 3 Sheets-Sheet 1

FIG. 1.

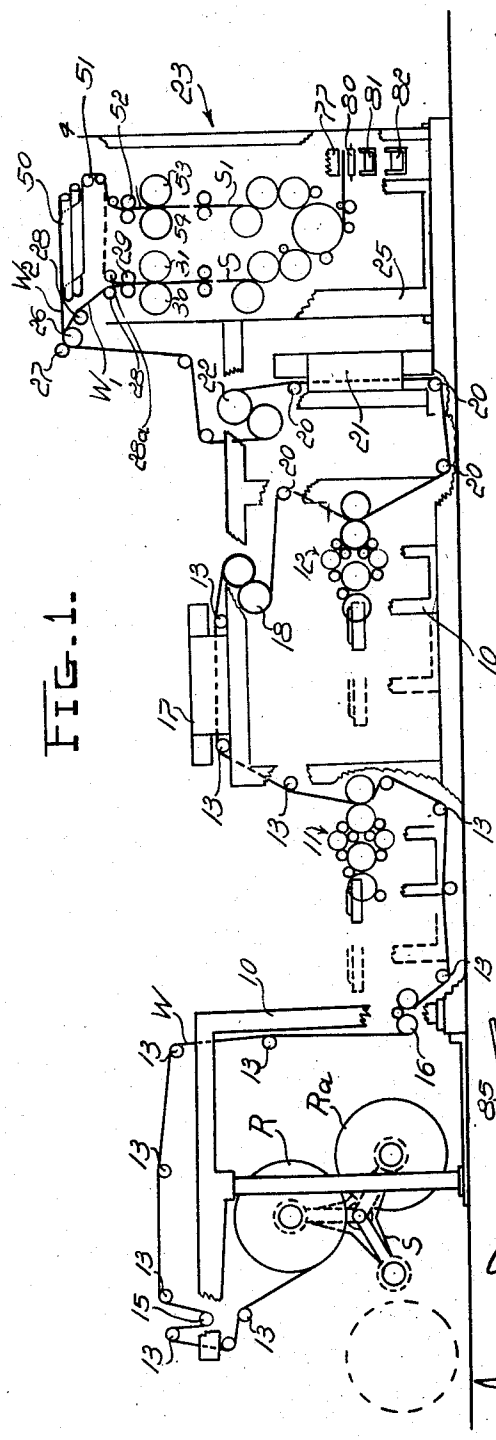


FIG. 2.

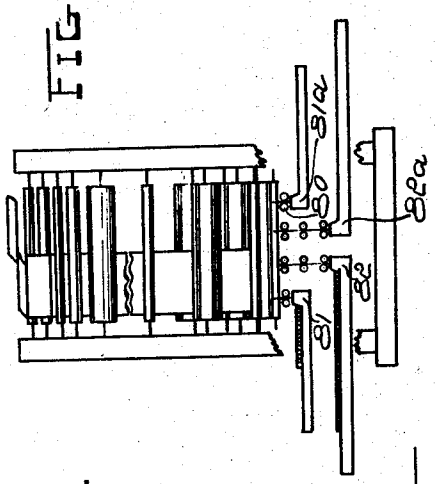
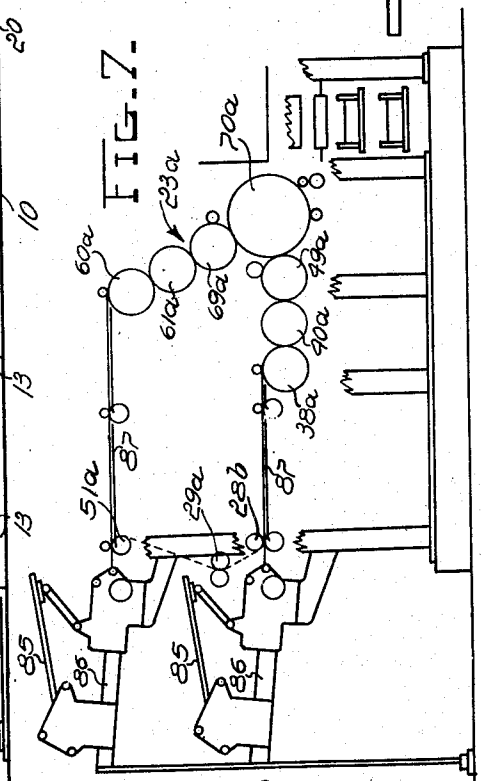


FIG. 7.



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MECHANISM FOR MULTIFOLDING PRINTED WEBS

Filed May 10, 1945 3 Sheets-Sheet 2

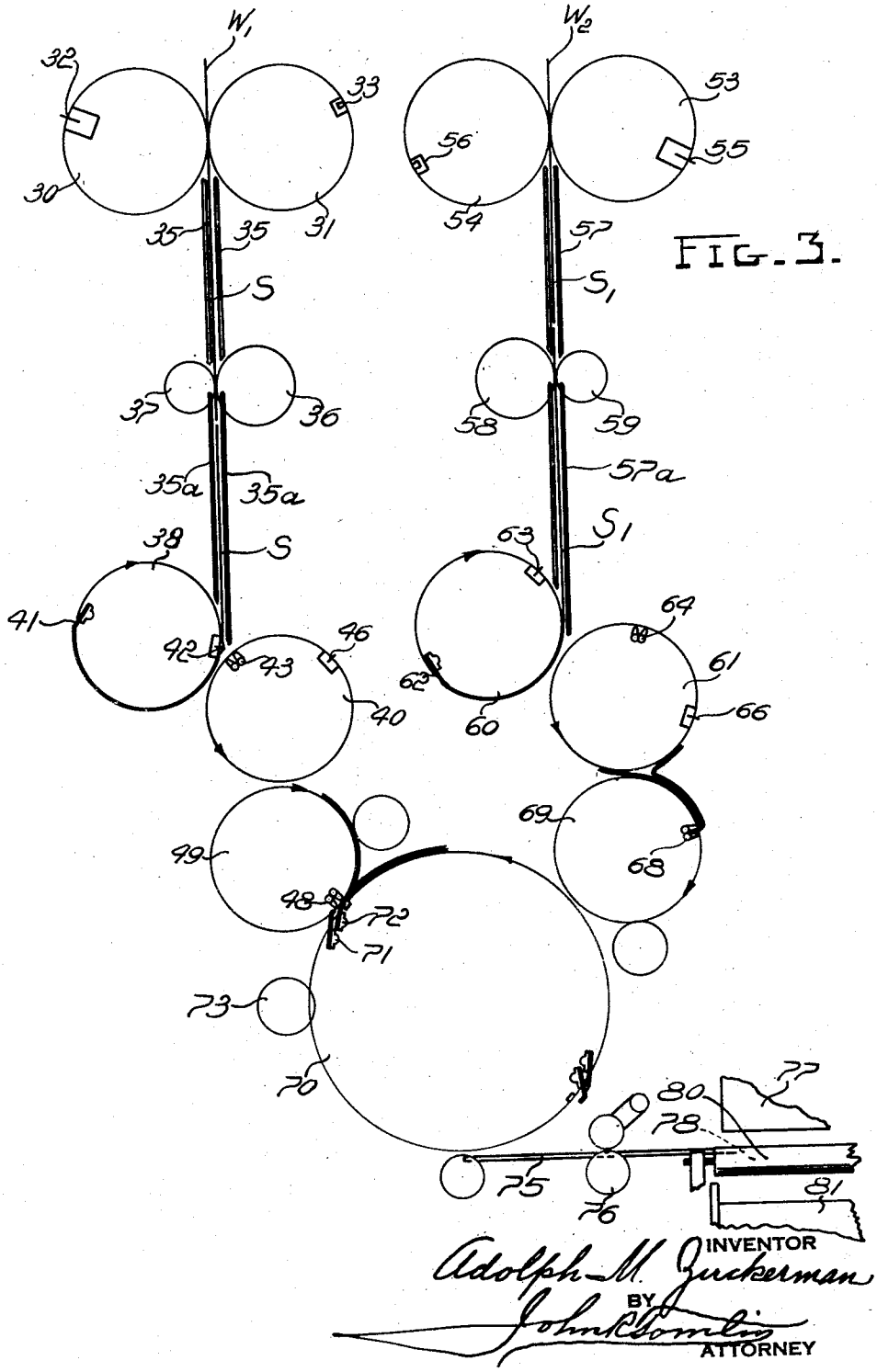


FIG. 3.

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MECHANISM FOR MULTIFOLDING PRINTED WEBS

Filed May 10, 1945 3 Sheets-Sheet 3

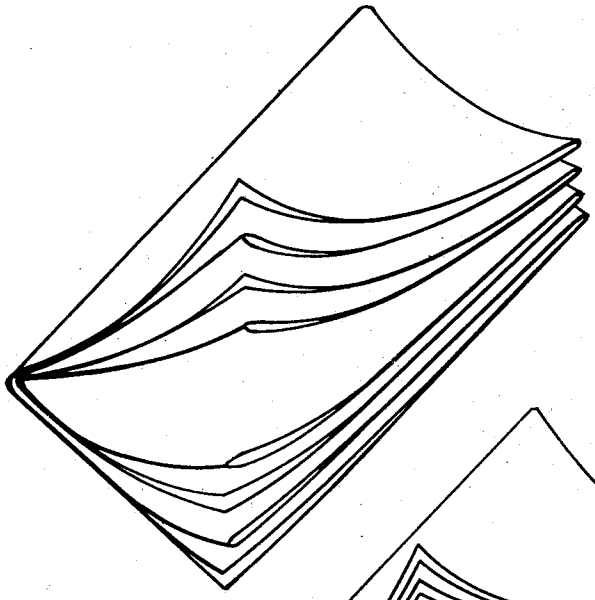


FIG. 4.

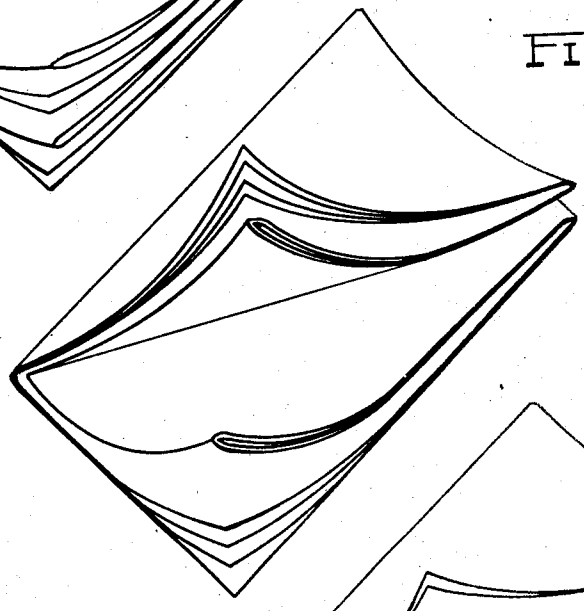


FIG. 5.

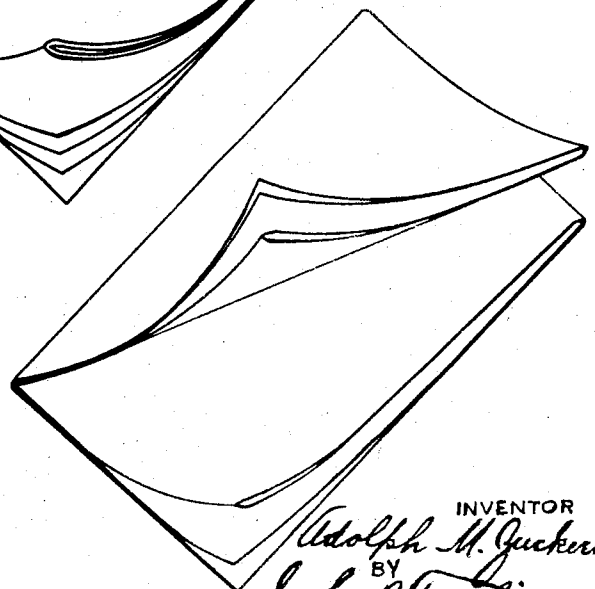


FIG. 6.

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2,487,404

MECHANISM FOR MULTIFOLDING PRINTED WEBS

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Application May 10, 1945, Serial No. 592,985

2 Claims. (Cl. 270—43)

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This invention relates to folding, and more particularly to new and improved method and mechanism for multi-folding printed sheets.

Heretofore, certain products have been produced by printing sheets in conventional sheet-fed printing presses, and then folding each sheet on a separate conventional sheet folder. The products thus produced are satisfactory as to printing quality and folding accuracy, but the speed of their production is much slower than the speed of production of products which are produced in rotary web-fed printing and folding machines.

Therefore, it is an object of this invention to provide improved method and mechanism for producing multi-folded printed products in a machine having rotary folding components.

Another object of this invention is to provide an improved folder in which sheets are run in separate parts through different cross folding mechanisms, and finally assembled and longitudinally folded into a signature comprising separate sections having closed heads.

A further object of this invention is to provide, for use with web-fed rotary printing machines, an improved folder in which a full-width web is slit into separate half-width webs or ribbons which are run in the same path in face to face relation through a cutting and cross folding mechanism, and longitudinally folded into a signature comprising inner and outer sections which are locked together and having closed heads.

An additional object of this invention is to provide, for use with a web-fed rotary printing machine, an improved folder having a first sheet cutting mechanism, a cooperating first cross folding mechanism, a second sheet cutting mechanism, cooperating second cross folding mechanism, a common collecting mechanism cooperably associated with both cross folding mechanisms to collect folded products therefrom, a longitudinal folding mechanism, and means for forwarding products from the collecting mechanism to the longitudinal folding mechanism whereby they are folded to produce signatures having separate sections each having closed heads.

Another object of this invention is to provide, for use with a web-fed rotary printing machine, an improved folder having a first sheet cutting mechanism, a cooperating first cross folding mechanism capacitated to produce two parallel cross folds, a second sheet cutting mechanism, a cooperating second cross folding mechanism capacitated to produce two parallel cross folds, a collecting cylinder to which products of both cross

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folding mechanisms are delivered and which forwards them simultaneously to a common longitudinal folding mechanism thereby producing signatures having two separate sections folded together and having closed heads.

A specific object of this invention is to provide, for use with a web-fed rotary printing machine, an improved folder in which a full-width web is slit into separate half-width webs that are run in parallel paths in face to face relation past cutting cylinders which cut the webs into sheets that are guided along the parallel paths to separate sets of cooperating folding cylinders which produce a double cross fold in each sheet, the folding cylinders delivering the sheets to a collecting cylinder which forwards them simultaneously to a common longitudinal folding mechanism.

A more specific object of this invention is to provide, for use with a web-fed rotary printing machine, a folder having first sheet cutting cylinders, first cross folding cylinders arranged to produce two spaced parallel cross folds, second sheet cutting cylinders, second cross folding cylinders arranged to produce two spaced parallel cross folds, means for guiding sheets from the sheet cutting mechanism to the folding mechanisms along parallel paths of travel, a common collecting cylinder for receiving products from the folding cylinders and to forward the collected products to a longitudinal folding mechanism which folds the sheets into signatures having separate sections folded together and having closed heads.

It is also an object of this invention to provide a folder 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 combination and arrangement of parts, and in the details of construction hereinafter described and claimed, it being understood that various changes in form, proportion and minor details of construction may be made within the scope of the claims without departing from the spirit or sacrificing any advantages of the invention.

For a complete disclosure of the invention, a detailed description thereof will now be given in connection with the accompanying drawings, forming part of the specification, wherein:

Figure 1 is a side elevation of a magazine perfecting press and the improved folder;

Figure 2 is an end view of the folder;

Figure 3 is an enlarged side view of the improved folder, part being omitted;

Figure 4 is a perspective view of a product produced by the improved folder;

Figure 5 is a similar view of another product produced by the folder;

Figure 6 is a similar view of still another product produced by the folder; and

Figure 7 is a side elevation depicting a modified form of folder in operable association with two conventional sheet feeders.

Referring to the drawings, in which similar reference characters designate corresponding parts, 10 indicates the frame of a conventional magazine perfecting press which includes a first printing unit 11, and a second or perfecting unit 12. A web W is lead to the printing units 11 and 12 from a supply roll R supported by a conventional reel or roll support R^a.

The web W is led from the active supply roll R past guide rollers 13, tension control roller 15, web feed rollers 16, to and through the first printing unit 11. After the web W passes through the first printing unit 11, it is guided by rollers 13 through the heating chamber of a conventional drier 17, and then around conventional cooling rollers 18. From the cooling rollers 18 the web is led around guide rollers 20 through the perfecting printing unit 12 and through the heating chamber of a second conventional drier 21, and then around cooling rollers 22. After passing the cooling rollers 22, the web W is led to the improved folder 23 which provides the subject matter of this invention.

The folder is supported by a frame 25, and it includes a drag roller 26 with which one or more slitting discs 27 cooperate, for a purpose to be hereinafter set forth. The web W is led over the drag roller 26 where it is preferably cut into two half-width webs W^1 and W^2. The first half-width web W^1 is led around guide rollers 28 to and between cooperating associated or nipping rollers 29, and then between conventional cooperating cutting cylinders 30 and 31 (Figures 1 and 3), the cylinder 30 being provided with the conventional cutting knife 32, and the cylinder 31 being provided with the conventional cutting abutment or rubber 33, which cut the web W^1 into sheets S of proper length, the sheets being relatively long owing to the fact that the web is cut only once during each revolution of the cutting cylinders.

After the web W^1 is cut into sheets, each sheet S is guided by vertical guides 35 to cooperating conventional nipping or propelling rollers 36 and 37. The rollers 36 and 37 are driven, and the roller 37 is preferably spring pressed or biased towards operable engagement with the driven roller 36. The nipping rollers 36 and 37 propel the sheet S through, additional vertical guides 35*a* to a pair of cooperating folding cylinders 38 and 40.

When the sheet S reaches the folding cylinder 38, it is taken by a conventional gripper 41 and conveyed partly around the cylinder 38 until a conventional folding blade 42, carried by the cylinder, tucks the intermediate portion of the sheet S into conventional folding jaws 43 operably supported by the cylinder 40, thereby cross-folding the sheet S at its center. The folding jaws 43 carry the cross-folded sheet partly around the folding cylinder 40 until its folding blade 46 tucks the intermediate portion of the cross-folded sheet S into folding jaws 48, carried by a third folding cylinder 49, thereby imparting a second cross fold to the sheet S, which fold is spaced but parallel with the first cross fold, thus producing a product having four thicknesses.

The second half-width web W^2 is led from the drag roller 26 over conventional turner bars 50, and then around guide rollers 51 to and between cooperating nipping or associated rollers 52. This web is led between cooperating cutting cylinders 53 and 54, similar to the cutting cylinders 30 and 31, these cylinders being provided with a conventional cutting knife 55 and abutment 56.

After the web W^2 is cut into sheets, each sheet S_1 is guided by vertical guides 57 to cooperating conventional nipping rollers 58 and 59, similar in construction and arrangement to the nipping rollers 36 and 37. The nipping rollers 58 and 59 propel each sheet S_1 through vertical guides 57^a to a pair of cooperating folding cylinders 60 and 61. When the sheet reaches the folding cylinder 60 it is taken by a gripper 62 and conveyed partly around the cylinder until its conventional folding blade 63 tucks the intermediate portion of the sheet S_1 into folding jaws 64, operably supported by the folding cylinder 61, thereby cross-folding the sheet at its center. The folding jaws 64 carry the cross-folded sheet partly around the folding cylinder 61 until its folding blade 66 tucks the intermediate portion of the cross-folded sheet S_1, into folding jaws 68 carried by a third folding cylinder 69, thereby imparting a second cross fold to the sheet, which fold is spaced from but parallel with the first cross fold, thus producing a product having four thicknesses.

A collecting cylinder 70 is provided to cooperate with both third folding cylinders 49 and 69, and this collecting cylinder has conventional grippers 71 and 72 which take a product from each of the third folding cylinders and carry them together past a slitting disc 73 which cuts each collected cross-folded product midway of their length to produce two separate eight-ply products. The cut products are then delivered to horizontal guides 75, and they are propelled along these guides by cooperating forwarding or nipping rollers 76 to two conventional chopper folders. The conventional folding blade 77 of each chopper folder folds the collected products lengthwise by tucking the sheets between horizontal longitudinally-disposed conventional nipping or folding rollers 78 and 80. This produces two sixteen-ply products from each eight-ply collected product, and these products are dropped into packer box deliveries 81 and 82 which extend laterally from the left side of the folder, as viewed in Figure 2. By this arrangement two thirty-two page signatures are produced and delivered from the left side of the folder 23 during each revolution of the cutting cylinders. Each signature comprises two separate sections folded together and each section having closed heads, as shown in Figure 4.

The combination and arrangement disclosed in this application affords relatively great flexibility in the choice of web runs to produce different products with the same mechanism.

Another web run may be resorted to by running a half-width web W^1 from the drag roller 26 through the inner side of the folder, or the left side, as viewed in Figure 1, along the hereinbefore disclosed path of travel. The second half-width web W^2 is led from the drag roller 26 over the turning bars 50, then around two guide rollers 51, and then back across the folder to its left side (Figure 1) and around a guide roller 28^a to the associating rollers 29, as indicated by the dotted lines in this figure. The web W^2 is associated with the web W^1 at the associating rollers 29 and

then it is led down the left side of the folder (Figure 1) with the web W^1 past the slitting disk **73** and finally to the chopper folders which deposit two thirty-two page signatures in the packer box deliveries during each revolution of the cutting cylinders. The sheets of each of these signatures are locked together, as depicted in Figure 5, to prevent separation and their tops or heads are closed.

The use of signatures of this formation are preferable when relatively thin paper is employed. However, when relatively thick paper which cannot be folded so flat is employed, then the signatures of the formation which are produced by the first web run and depicted in Figure 4 is preferred.

Another web run may be resorted to by silencing the slitter disc **27** which coacts with the drag roller **26**, and then run a full-width web down either side of the folder, as viewed in Figure 1, the full-width web being carried through the cutting and folding cylinders to the collecting cylinder **70**. In this run the collecting cylinder **70** is operably engaged by three slitter discs **73** that cut each sheet into four products which are then forwarded to the four chopper folders. The chopper folders fold the sheets longitudinally and deposit the folded products into the packer box deliveries **81**, **82**, **81***a* and **82***a*, best seen in Figure 2, there being a delivery of a product to each of the four packer boxes during each revolution of the cutting cylinders. This run results in the formation of four sixteen-page products, such as depicted in Figure 6.

The flexibility of this arrangement permits the continued operation of the folder even after some of its components have become deranged or broken, because it is possible to reverse the turner bars, by means well known to those skilled in the art, and then lead the webs down the right side of the folder, as viewed in Figure 2, instead of the left side, where two products may be produced similar to those formed on the left and illustrated in Figures 4 and 5. For each revolution of the cutting cylinders, two similar products are delivered to the right hand deliveries **81***a* and **82***a*, as viewed in Figure 2, instead of the left hand deliveries, as hereinbefore disclosed.

Again, a full-width web may be led to avoid the turner bars, and then carried down the right hand side of the folder, as viewed in Figure 1. This web run permits the delivery of four products of the formation depicted in Figure 6, one product being delivered to each of the four deliveries **81**, **82**, **81***a* and **82***a* during each revolution of the cutting cylinders.

Figure 7 discloses an arrangement in which a modified form of the folder is depicted in cooperable relation with two conventional sheet feeders of the "Cross" type. Feeders of this type are arranged so that sheets are placed on the upper inclined surface of a board **85**, on which they are combed out, and in this relation they are led out around the outer end of the feed board and underneath it to a secondary feed table **86**, from which they are forwarded along guides **87** to the modified folder **23***a*. This folder includes co-acting folding cylinders **38***a*, **40***a* and **49***a* which receives sheets from the lower feed table **86** and guides **87** and twice cross-folds each sheet and then delivers it to a common collecting cylinder **70***a*. Sheets from the upper feed table and guides are delivered to co-acting folding cylinders **60***a*, **61***a* and **69***a*, which twice cross folds each sheet and delivers it to the common collecting cylinder **70***a*. In this arrangement the sheets

are carried through the folder in substantially the same manner as hereinbefore disclosed in connection with the mechanism depicted in Figures 1, 2 and 3. This construction, of course, requires no drag roller, turner bars or cutting cylinders, but it presents substantially the same operating flexibility as the arrangement hereinbefore disclosed.

If desired, a sheet may be turned downwardly from the upper guides around rollers **51***a*, through nipping rollers **29***a* and around a roller **28**[b] to the lower guides **87**. In such run, the cylinders **60***a*, **61***a* and **69***a* are silenced. This sheet is run together with the sheet from the lower feed board through the lower guides **87** and through the cylinders **38***a*, **40***a* and **49***a* which twice-folds the sheets in locked relation and then delivers them to the common collecting cylinder **70***a*. The sheets are then slit into four sections and each section is folded by a chopper folder, and the resulting four folded products, depicted in Figure 5 and including 32 pages, are conveyed away from the folder by four deliveries in the manner hereinbefore disclosed in connection with the structure depicted in Figures 1, 2 and 3.

With this arrangement, sheets from either the upper or lower feeders and guides may be conveyed through the cylinders **38***a*, **40***a* and **49***a*, or the cylinders **60***a*, **61***a* and **69***a*, depending on whether sheets from the upper or lower guides are to be folded. Such run gives each sheet two parallel folds and the folded sheets are slit into four sections and each section is folded by a chopper folder to produce sixteen page products similar to those depicted in Figure 6. These folded products are delivered by the four deliveries, hereinbefore disclosed.

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.

Having thus described the invention, what is claimed as new and useful is:

1. In a folder for a printing machine, a drag roller, a collecting cylinder operably remote from the drag roller, a first web and sheet path comprising right and left portions, a second web and sheet path comprising right and left portions, each path operably interposed between the drag roller and the collecting cylinder and formed by web guide rollers, cooperable cutting cylinders, sheet guides, sheet propelling rollers and folding cylinders cooperable to cross fold each sheet and deliver it to the collecting cylinder, means for slitting a full-width web at the drag roller into two half-width webs, means for directing the half width webs selectively either to corresponding portions of the two said web paths or associating the half width webs and directing them together through the same portion of a web path, slitting means associated with the collecting cylinder for cutting transversely folded products thereon into quarter width products and a plurality of longitudinal folding mechanisms operably associated with the collecting cylinder for receiving the cross folded products therefrom and longitudinally folding the said products.

2. In a folder for a printing machine, a drag roller, a collecting cylinder operably remote from the drag roller, a first web and sheet path comprising right and left portions, a second web and sheet path comprising right and left portions,

each path operably interposed between the drag roller and the collecting cylinder and formed by web guide rollers, cooperable cutting cylinders, sheet guides, sheet propelling rollers and folding cylinders cooperable to form two spaced parallel cross folds in each sheet and deliver the folded sheet to the collecting cylinder, means for slitting a full-width web at the drag roller into two half-width webs, means for directing the half width webs selectively either to corresponding portions of the two said web paths or associating the half width webs and directing them together through the same portion of a web path, slitting means associated with the collecting cylinder for cutting transversely folded products thereon into quarter width products and a plurality of longitudinal folding mechanisms operably associated with the collecting cylinder for receiving the cross folded

products therefrom and longitudinally folding the said products.

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