Jan. 13, 1959 G. I. KOONS ET AL 2,868,539

METHOD OF AND APPARATUS FOR FORMING SIGNATURES

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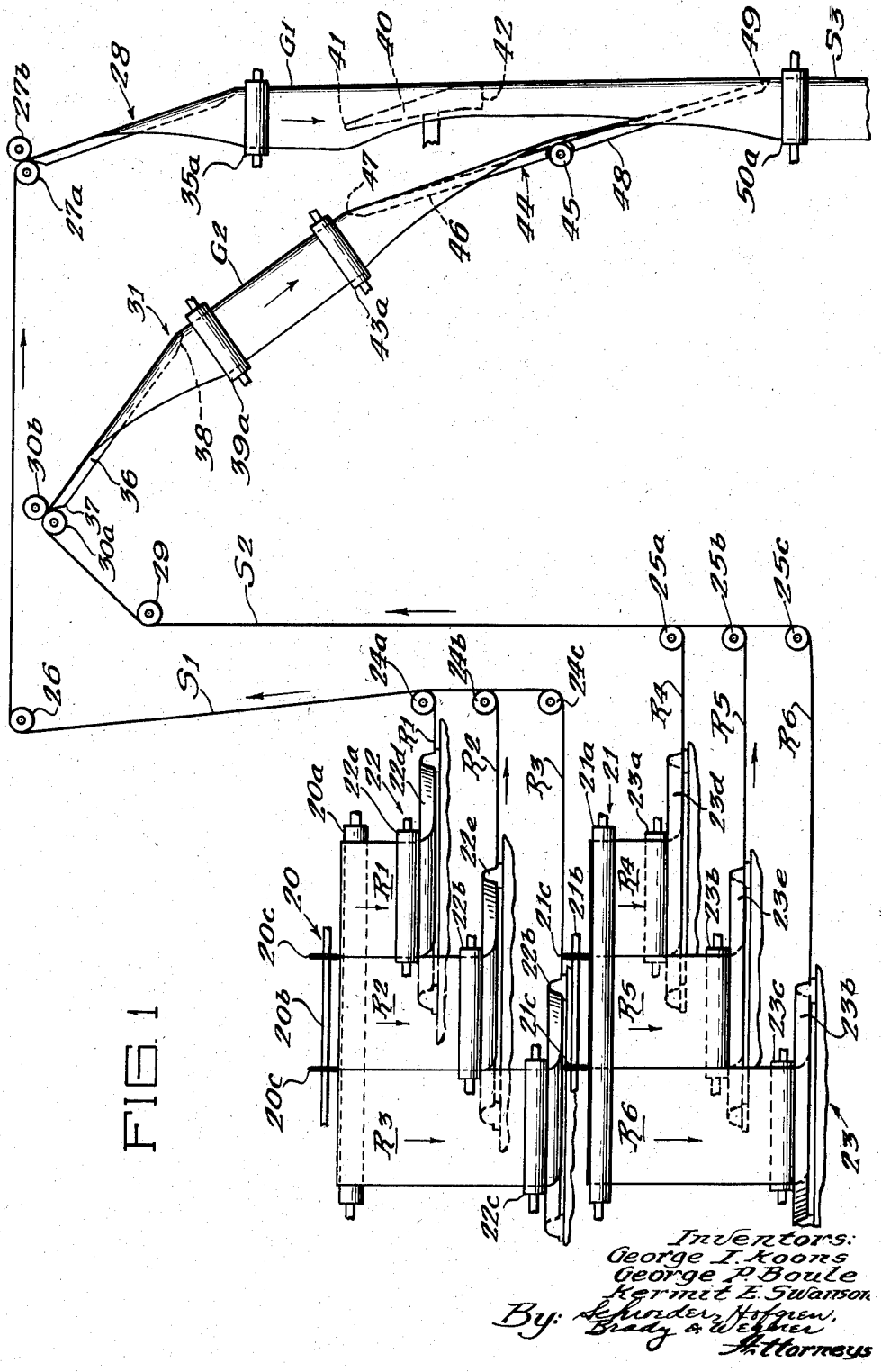


FIG. 1

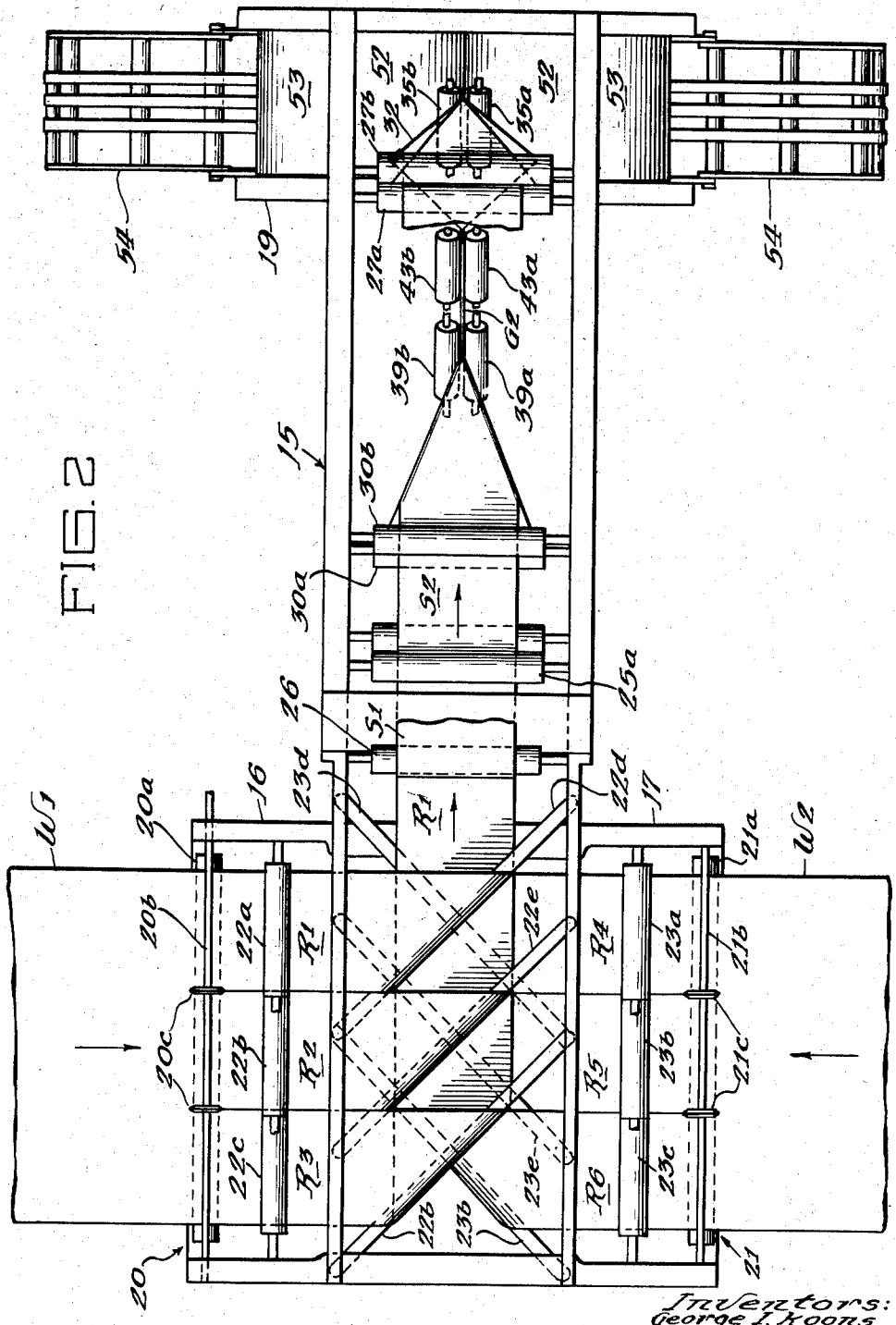
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FIG. 2



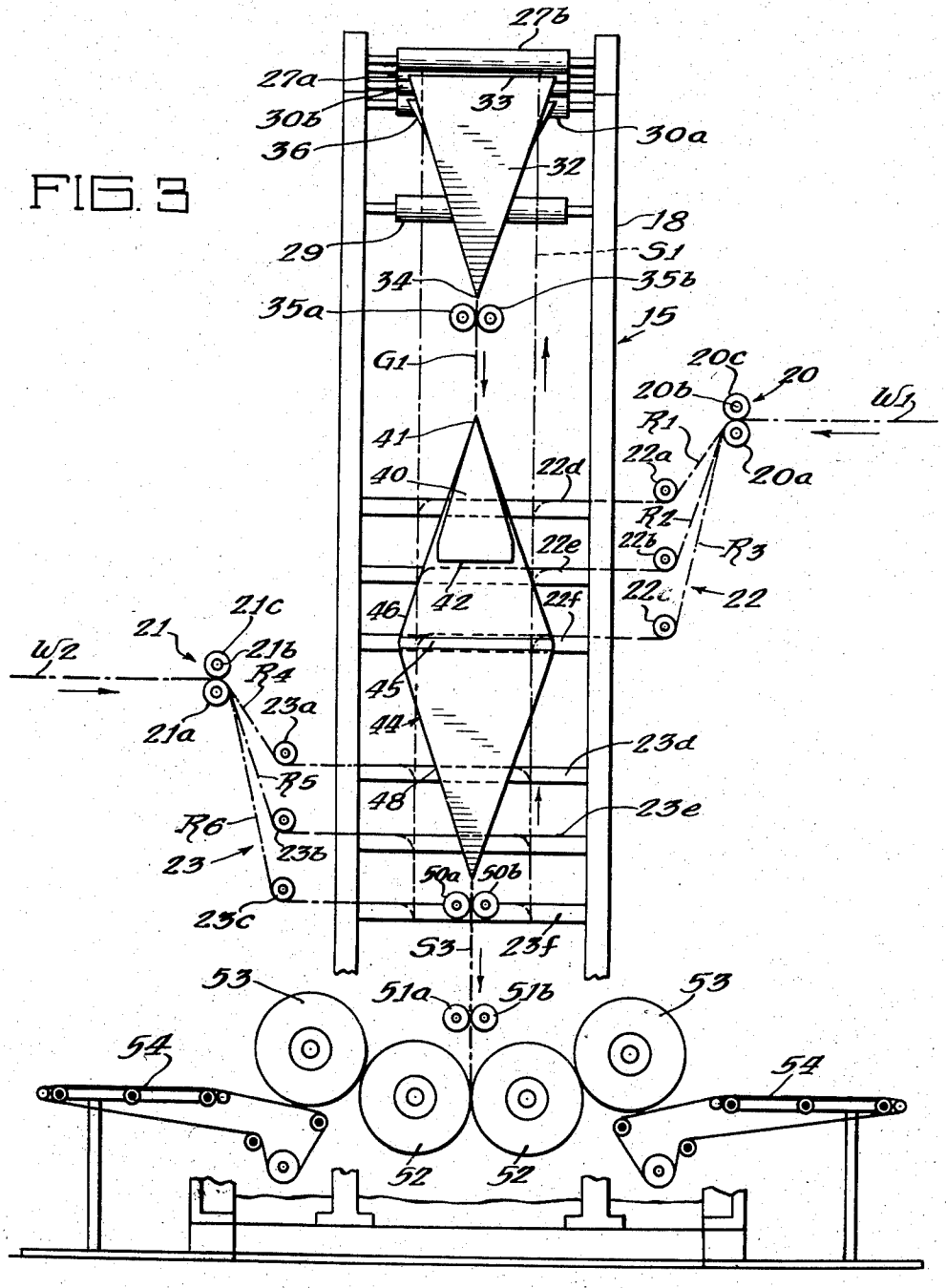
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METHOD OF AND APPARATUS FOR FORMING SIGNATURES

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FIG. 3



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FIG. 4

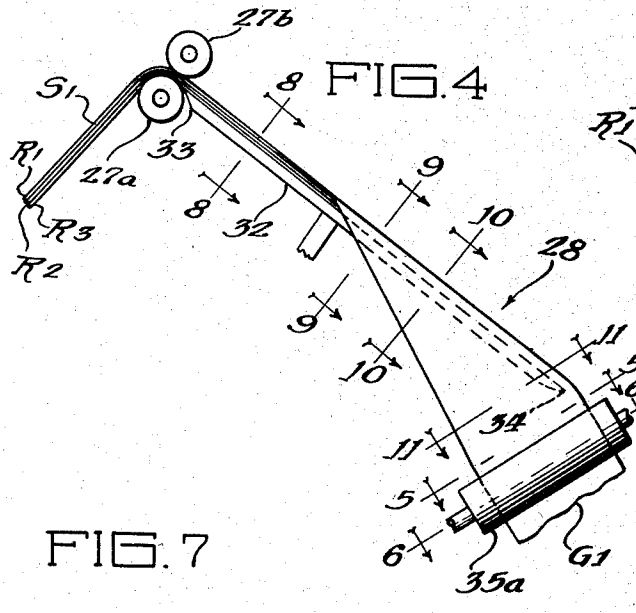


FIG. 5

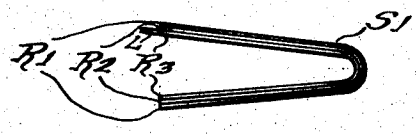


FIG. 6

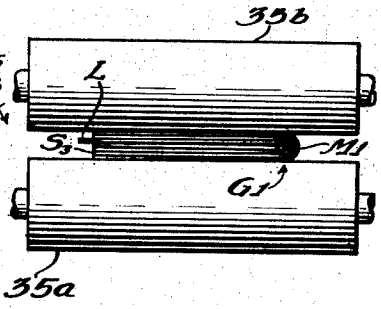


FIG. 7

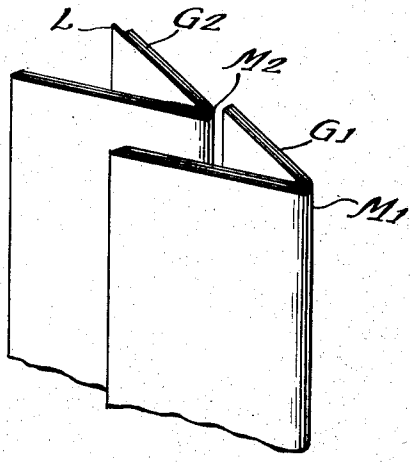


FIG. 12

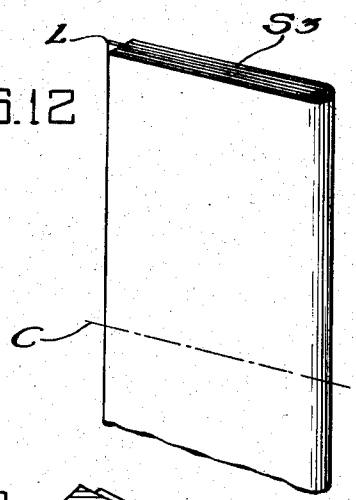


FIG. 13

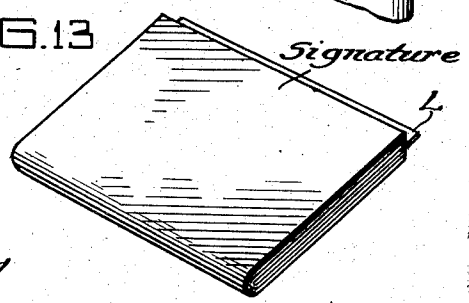
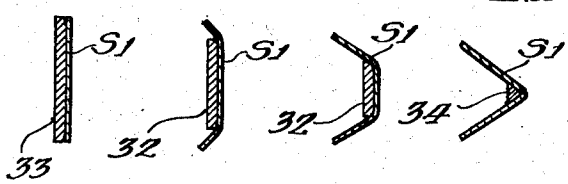


FIG. 8 FIG. 9 FIG. 10 FIG. 11



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METHOD OF AND APPARATUS FOR FORMING SIGNATURES

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Application October 19, 1955, Serial No. 541,371

6 Claims. (Cl. 270—41)

This invention relates to a method of and apparatus for forming signatures of coated stock containing at least 16 pages by means of former boards.

Forming signatures with former boards is inherently more rapid and simple than using jaw folders because the signatures are continuously folded from a traveling ribbon of paper which is then cut into signature lengths. Where jaw folders are used it is necessary to first cut the printed ribbons into signature lengths, then assemble them and finally fold them in the jaw folders.

The present trend in the printing industry is to use signatures having as large a number of pages as is reasonably practical in order to reduce the number of pieces which must be handled both in the press room and in the bindery. Where signatures are formed from coated paper stock of the type which is used in high grade magazines and books with large numbers of half-tone cuts and color work it has not heretofore been possible to produce more than a 12 page signature by means of former boards because of the problem of handling more than three ribbons, or strips of coated stock over a former board. Three strips may be kept aligned as they pass through the equipment including the former boards, but if more than three strips are run at a time the internal ribbons can become disaligned, resulting in off-center folding of certain of the strips. Accordingly, wherever a signature of coated paper stock is to contain more than 12 pages it is customary to make the signatures only on jaw folders.

In accordance with the present invention signatures of 16, 24, or even more pages of coated stock may be assembled by the use of former boards, completely eliminating the need to use jaw folders in these larger types of signatures. A 16 page signature, for example, may be prepared on former boards by taking two paper strip sets each of which contains at least two strips of paper, and running each strip set over a former board to fold it longitudinally in the customary fashion and form a strip group of four interleaved strips which are joined along the folded margin. One of the two strip groups thus formed is then continuously slid between the innermost strips of the other group to provide a signature strip containing eight interleaved strips joined along one margin, and this signature strip may then be cut into signature lengths. The eight interleaved strips will, of course, provide a 16 page signature.

Similarly, by using strip sets each of which contains three superposed paper strips, folding each strip set to provide a strip group and then continuously sliding one group between the innermost strips of the other group a signature strip is provided which contains 12 interleaved strips to form a 24 page signature. This process may be carried on for additional steps, slipping a further group of six interleaved strips between the 12 which are already together to provide a 36 page signature, etc.

The apparatus of the invention is illustrated in a preferred embodiment in the accompanying drawings, in which:

Fig. 1 is a generally schematic side elevational view of the apparatus;

Fig. 2 is a plan view thereof;

Fig. 3 is a front elevational view thereof;

Fig. 4 is a side elevational view of one strip set passing over a former board;

Fig. 5 is a section taken as indicated along the line 5—5 of Fig. 4;

Fig. 6 is a section taken as indicated along the line 6—6 of Fig. 4;

Fig. 7 is a fragmentary perspective view of one strip group being associated with another strip group to form a signature strip;

Figs. 8–11, inclusive, are, respectively, sectional views taken as indicated along the lines 8—8 to 11—11, inclusive, of Fig. 4;

Fig. 12 is a fragmentary perspective view of a six strip group; and

Fig. 13 is a perspective view of a signature cut to appropriate length.

Referring to the drawings in greater detail, and referring first to Figs. 1 and 3, the apparatus has a suitably constructed frame indicated generally at 15 which has paper web frame portions 16 and 17, as seen in Fig. 2, a folder frame 18, and an outfeed frame 19. Paper webs W1 and W2 from the printing presses pass, respectively, through slitter mechanisms 20 and 21. As best seen in Figs. 1 and 2, the slitter 20 includes a paper carrying roll 20*a* and a slitter shaft 20*b* provided with a pair of rotary knives 20*c* which continuously slit the web W1 longitudinally into three ribbons R1, R2 and R3. Similarly, the slitter 21 has a paper carrier roll 21*a* and a slitter shaft 21*b* provided with two rotary knives 21*c* which slit the web W2 longitudinally into three ribbons R4, R5 and R6. It will be understood that each of the ribbons R1 to R6 has been continuously printed from plates carrying the copy for four pages of a book or magazine so that each ribbon may be folded longitudinally to form two page strips which are joined along a folded margin and have their longitudinal edges in register. The page strips may be cut into page lengths each of which forms four pages of a book or magazine.

From the slitters 20 and 21 the ribbons pass to ribbon turning and superposing mechanism, the mechanism for the ribbons R1 to R3 being indicated generally at 22 while that for the ribbons R4 to R6 is indicated generally at 23. As best seen in Fig. 3, the ribbons R1, R2 and R3 pass, respectively, under guide rolls 22*a*, 22*b* and 22*c* which take the three ribbons off at different levels for travel to three vertically aligned strip turning bars 22*d*, 22*e* and 22*f* which, as seen in Fig. 2, are set in the frame 15 at a 45° angle to the path of travel of the ribbons R1, R2 and R3 from the slitter mechanism 20 so that when each ribbon passes around the turning bar it assumes a path of travel at right angles to its original path and the three strips are in vertically spaced alignment. Similarly, the ribbon turning and superposing mechanism 23 includes guide rollers 23*a*, 23*b* and 23*c* which respectively take the ribbons R4, R5 and R6 off at different levels for passage around turning bars 23*d*, 23*e* and 23*f*, respectively, from which the three ribbons move in vertically spaced alignment in a direction at right angles to their travel through the slitter mechanism 21.

After passing the turner bars the ribbons R1, R2 and R3 pass, respectively, around aligning rolls 24*a*, 24*b* and 24*c* while the ribbons R4, R5 and R6 pass around aligning rolls 25*a*, 25*b* and 25*c*. The ribbons R1, R2 and R3 come off the aligning rolls in registering, face-abutting superposed relationship to provide a ribbon set S1, while similarly the ribbons R4, R5 and R6 when they come off the aligning rolls form a second ribbon set S2. As best seen in Fig. 1, the ribbon set S1 passes around a directing

roller **26** to infeed rollers **27***a* and **27***b* for folder board means indicated generally at **28**; while the ribbon set **S2** passes around a directing roller **29** and between infeed rollers **30***a* and **30***b* for folder board means indicated generally at **31**.

As best seen in Fig. 4, the folder board means **28** includes an elongated wedge-shaped folder board **32** which has a broad upper end **33** onto which the ribbon set **S1** passes from the infeed rollers **27***a* and **27***b*, and the folder board tapers uniformly to a very narrow tip **34** which, as seen in Fig. 11, is triangular in cross section. The ribbon set **S1** is very carefully aligned as it passes through the infeed rollers **27***a* and **27***b* so that the lower end **34** of the former board **32** is on the longitudinal center line of the ribbons forming the set. Thus, as seen in Figs. 8 to 11, the ribbon set **S1** has its margins moved toward each other until it is in a V-formation when it passes off the tip **34** of the folder board, and it is immediately conducted between a pair of ribbon closing rollers **35***a* and **35***b* so that the unjoined margins of the lowermost ribbon **R3** of the set **S1** are brought into face-abutting relationship and the fold is tightly crimped to convert the three ribbons into six interleaved page strips forming a first strip group **G1** which has a closed margin **M1**. The unjoined margins of the six page strips forming the strip group **G1** are in registry.

The former board means **31** is similar to the former board means **28**, in that it includes a wedge-shaped former board **36** which has a wide upper end **37** adjacent the infeed rolls **30***a* and **30***b*, and tapers to a narrow triangular tip **38** which is positioned on the longitudinal center line of the ribbon set **S2**. The former board means **31** also includes closing rollers **39***a* and **39***b*.

Below the closing rollers **35***a* and **35***b* the strip group **G1** passes over a strip separating member **40** which has generally the shape of an inverted folder board which has a narrow end **41** toward the closing rollers **35***a* and a saddle-shaped wider end **42** in the direction of travel of the strip group **G1**. The separator member **40** is between the innermost strips **G3** (see Fig. 6) so that the strip group **G1** is opened along its unjoined margins between the innermost strips. It is then ready to receive the second strip group **G2** which passes from the closing rollers **39***a* and **39***b* through a pair of guide rollers **43***a* and **43***b* onto an adjustable guide member **44** which is generally like a pair of wedge-shaped former boards arranged with their broad ends together on a central support shaft **45** on which the guide member is tiltably supported for adjustment with respect to strip groups **G1** and **G2**. The strip guide **44** has a first wedge-shaped section **46** which acts as a strip receiving section and has a pointed upper end **47** just below the guide rolls **43***a* and **43***b*, while below the support member **45** is a second wedge-shaped strip-delivering section **48** which has its pointed tip **49** positioned between the separated strips of the strip group **G1**. Thus, the strip group **G2** passes over the strip receiving portion **46** of the guide member **44** which opens it and as it passes off the strip-delivering portion **48** it slides between the separated innermost strips **G3** of the strip group **G1** and the joined margins **M2** of the strip group **G2** are slid firmly against the joined margins **M1** of the strip group **G1** as the two associated strip groups pass over the narrow lower tip **49** of the delivery portion **48** of the guide member. The associated strips **G1** and **G2** are then passed through an additional pair of closing rolls **50***a* and **50***b* after which they travel together as a single signature strip **S3** having 12 interfolded page strips which provide 24 pages of a book or magazine.

From the closing rollers **50***a* the signature strip **S3** passes between end guide rollers **51***a* and **51***b* from which it may follow a conventional course between cutting cylinders **52** which cut it into signatures, as by cutting along the broken line C in Fig. 12. The signatures travel around delivery cylinders **53** and are laid in shingled relationship on delivery belts **54**.

It will be apparent to those skilled in the art that the present method of forming 16, 24, or more page signatures from coated stock has a great many advantages. In the first place, the traveling strip operation for the forming of signatures is far faster than is possible with jaw folders so that the presses may be run at higher speeds. The former board folders are far less expensive to construct and maintain than are jaw folders, and are far less subject to damage or maladjustment requiring shutdowns.

A major factor where large quantities of paper are being printed and bound on saddle stitchers, as is the case with many magazines, is the paper saving which can be realized by using larger signatures. This is because a center sheet of each signature must have a laterally projecting "lap" such as the lap "L" shown in Figs. 5 to 7, 12 and 13, by means of which the signature may be grasped by a gripper to open it for mounting on the saddle stitch conveyor; and the larger the signatures the fewer laps are required.

Flexibility of book or magazine arrangement is possible because different types of paper stock can be put into a single signature; and a glue strip may be run on a strip group or a signature strip for making a center insert of a single strip (2-page signature).

The disclosed method of forming signatures also permits a broad flexibility in the combining of color pages; and by eliminating the use of jaw type folders eliminates the smearing of pages which is encountered with such folders.

The foregoing detailed description is given for clearness of understanding only and no unnecessary limitations are to be understood therefrom, as some modifications will be obvious to those skilled in the art.

We claim:

1. In apparatus for forming signatures of coated paper containing from sixteen to twenty-four pages: first ribbon forwarding means for feeding a first ribbon set containing two or three reel-length paper ribbons in registering superposition; first former board folder means for continuously forming a longitudinal fold line in the first ribbon set to provide a first strip group of interleaved strips which are joined along one margin; a wedge shaped strip separating member the narrow end of which is positioned between the innermost strips of the first strip group as said group leaves the former board means to partially reopen the strips of said group along its fold line; second ribbon forwarding means for feeding a second ribbon set containing two or three reel-length paper ribbons in registering superposition; second former board folder means for continuously forming a longitudinal fold line in the second ribbon set to provide a second strip group of interleaved strips which are joined along one margin; guide means adjacent the fold line of the first strip group to guide said second strip group between the innermost partially reopened strips of the first strip group with the fold lines abutting; and means for refolding the first strip group around the second strip group.

2. In apparatus for forming signatures of coated paper containing from sixteen to twenty-four pages: first ribbon forwarding means for feeding a first ribbon set containing two or three reel-length paper ribbons in registering superposition; first former board folder means for continuously forming a longitudinal fold line in the first ribbon set to provide a first strip group of interleaved strips which are joined along one margin; a wedge shaped strip separating member the narrow end of which is positioned between the innermost strips of the first strip group as said group leaves the former board means to partially reopen the strips of said group along its fold line; second ribbon forwarding means for feeding a second ribbon set containing two or three reel-length paper ribbons in registering superposition; second former board folder means for continuously forming a longitudinal fold line in the second ribbon set to provide a second strip group of interleaved strips which are joined along one margin; guide

means having a wedge shaped receiving end to partially reopen said second strip group along its fold line, and a delivery end which tapers to a narrow edge along which the fold lines of both strip groups pass in superposition with said second group positioned between the innermost partially reopened strips of said first group; and means for refolding the first strip group around the second strip group.

3. A method of forming signatures of coated paper containing at least sixteen pages which includes the steps of continuously forwarding two paper ribbon sets each of which contains at least two and no more than three registeringly superposed roll-length printed paper ribbons, continuously forming a longitudinal fold line in each of said ribbon sets, crimping each of said fold lines to provide two strip groups each containing at least four and no more than six interleaved strips which are joined along one margin and have their unjoined marginal portions abutting, separating the unjoined margins of the strips of both of said groups between the innermost strips of the group in readiness for association of said two groups, continuously sliding one of said two strip groups between the separated margins of the other strip group and moving the fold lines of the two groups into abutment to provide a single signature strip containing at least eight and no more than twelve interleaved strips, closing said separated margins, and cutting said signature strip into signature lengths.

4. A method of forming signatures of coated paper containing at least sixteen pages which includes the steps of: continuously forwarding two paper ribbon sets each of which contains at least two and no more than three registeringly superposed roll-length printed ribbons of coated paper; continuously forming a longitudinal fold line in each of said ribbon sets to provide two strip groups each containing at least four and no more than six interleaved strips which are joined along one margin; crimping the fold line of one of said sets and bringing the unjoined margins of said strip group into abutment; separating the unjoined margins of the strips of said one of said groups between the innermost strips in readiness to receive the other strip group; continuously sliding said other strip group between said separated margins and moving the fold lines of the two groups into abutment to provide a single signature strip containing at least eight and no more than twelve interleaved strips; closing said separated margins; and cutting said signature strips into signature lengths.

5. A method of forming signatures of coated paper containing at least sixteen pages which includes the steps

of: continuously forwarding two reel-length webs of coated paper; slitting each of said webs longitudinally to form at least two and no more than three ribbons from each web; registeringly superposing all the ribbons formed from each web to provide two paper ribbon sets, each of said sets containing at least two and no more than three ribbons; continuously forming a longitudinal fold line in each of said ribbon sets to provide two strip groups each containing at least four and no more than six interleaved strips which are joined along one margin; crimping the fold line of one of said sets and bringing the unjoined margins of said strip group into abutment; separating the unjoined margins of the strips of said one of said groups between the innermost strips in readiness to receive the other strip group; associating said strip groups by continuously sliding the other group between the separated margins of the innermost strips of said one group with the fold lines of both groups in abutment to provide a signature strip containing at least eight and no more than twelve interleaved strips; and cutting said signature strip into signature lengths.

6. A method of forming signatures of coated paper which includes the steps of: continuously forwarding two paper ribbon sets each of which contains the maximum number of roll-length printed coated paper ribbons which may be forwarded in longitudinally registering super-position; maintaining the ribbons in each of said ribbon sets in longitudinally registering super-position; continuously forming a longitudinal fold line in each of said ribbon sets to provide two strip groups each containing interleaved strips which are joined along one margin; crimping the fold line of one of said sets and bringing the unjoined margins of said strip group into abutment; separating the unjoined margins of the strips of said one of said groups between the innermost strips in readiness to receive the other strip group; associating said strip groups by continuously sliding the other group between the separated margins of the innermost strips of said one group with the fold lines of both groups in abutment to provide a signature strip containing all the strips of both groups; and cutting said strip into signature lengths.

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