BOOKBINDING MACHINE WITH ENDLEAF FOLDING MEANS

Inventors: Jack Bendror, Sands Point; Gastone Venco, Huntington, both of N.Y.

Assignee: Roblins and Bendron Associates Inc., Nassau, N.Y.

Filed: Dec. 15, 1972

Appl. No.: 315,547

U.S. Cl. ........................................ 11/1 R
Int. Cl. .......................................... B42c 15/00
Field of Search ................................ 11/1 R

References Cited
UNITED STATES PATENTS

Primary Examiner—Lawrence Charles
Attorney, Agent, or Firm—Samuel J. Stoll et al.

ABSTRACT

Bookbinding machine which embodies means for folding the outer leaves of end leaf assemblies which are attached to the sides of the spine of a book. The folds are formed by placing a backing plate with a relatively low frictional coefficient behind each outer leaf, then sliding the outer leaf on said backing plate in the direction of the spine of the book to form a loop, pressing the loop to form a fold, and adhesively securing the fold to that portion of the leaf assembly which is attached to the side of the spine of the book.

16 Claims, 18 Drawing Figures
BOOKBINDING MACHINE WITH ENDLEAF FOLDING MEANS

BACKGROUND OF THE INVENTION

Field of the Invention

The bookbinding and rebinding field, and, particularly, the process of securing end leaf assemblies to bound books preparatory to covering the books.

Description of the Prior Art

The traditional method of mounting end leaves on books is, at least in part, a manual operation. Two separate securing procedures are required; one is to attach the inner leaf to the books by gluing, sewing or other conventional means; the second is to form a fold in the outer leaf and to secure the fold to the inner leaf to provide a hinged connection between the two leaves.

An automated version of this traditional method is shown in U.S. Pat. No. 3,330,716 issued to Fred James, Jr., et al., on July 11, 1967. However, this automated version is not satisfactory for the reason, among others, that it provides for progressive folding of the outer leaf along the longitudinal axis of the fold. This procedure tends to produce a biased positioning of the outer leaf wherein the outer leaf does not precisely register with the inner leaf or with the pages of the book.

An improved automated version of the traditional method is disclosed in U.S. Pat. No. 3,478,378, issued to Paul J. Glasgow on Nov. 18, 1969. In this improved version, the fold in the outer leaf is produced in a two-step operation wherein a loop is formed in the first step and the loop is flattened to form a fold in the second step. Although both the loop and the fold are formed progressively, the progression is perpendicular to the longitudinal axis of the loop or fold as the case may be. This procedure prevents the biased positioning of the outer leaf and, for this reason alone, constitutes an improvement over James, et al.

In the Glasgow Patent, when three-leaf assemblies are used, the frictional coefficient between the outer and intermediate leaves should be exceeded by the frictional coefficient between the intermediate and inner leaves. When two-leaf assemblies are used, the frictional coefficient between the facing sides of the outer and inner leaves should be exceeded by the frictional coefficient on the non-facing sides of the two leaves.

It is evident that the Glasgow patent requires the use of special paper for the end leaf assemblies, and this, in turn, requires the cooperation of those who make the end leaf assemblies and those who make paper for same. It is also evident that the manufacturing requirement of a frictional coefficient differential may conflict with other factors and considerations, such as conformity between the paper of which the pages of the book are made and the paper of which the end leaves are made.

SUMMARY OF THE INVENTION

The present invention constitutes an improvement over the Glasgow Patent in the sense that the present invention makes it possible to apply the principles of the Glasgow Patent to end leaves made of any kind or kinds of paper, regardless of their frictional coefficients or any frictional coefficient differential. Stated differently, no special end leaf paper is required in connection with the present invention.

More particularly, the present invention provides a leaf-backing plate behind the outer leaf on each end leaf assembly of a book processed by the machine which is hereinafter more fully described. In front of each said outer leaf is a leaf-engaging element which engages the outer leaf against the backing of the leaf-backing plate.

It is the function of the leaf-backing plate to separate the outer leaf from the inner leaf (and intermediate leaf, if any) of the end leaf assembly and to provide a supporting surface on which the outer leaf can slide. It is the function of the leaf-engaging element to form a loop in the outer leaf by sliding it on the backing plate in the direction of the spine of the book. If the frictional coefficient between the leaf-engaging element and the outer leaf exceeds the frictional coefficient between the leaf-backing plate and the outer leaf, this operation is perfectly feasible. To insure such frictional coefficient differential, the leaf-backing plate is made of metal or other suitable low friction material and the leaf-engaging element is made of natural or synthetic rubber or any other suitable high friction material.

In short, the present invention renders it feasible to apply the looping method of forming a fold in the outer leaf of an end leaf assembly regardless of the kind or kinds of paper that comprise the end leaf assembly.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a fragmentary side view of a bookbinding machine embodying the present invention.

FIG. 2 is an enlarged fragmentary view partly in section, showing one of the outer leaf separating means.

FIG. 3 is a view similar to that of FIG. 1 but showing the opposite side of the machine.

FIG. 4 is a fragmentary top view of the machine showing the present invention.

FIG. 5 is an enlarged fragmentary view, partly in horizontal section showing the outer leaf separating means of the present invention.

FIG. 5A is a view similar to that of FIG. 5, but showing the position of a book, in its progress through the bookbinding machine, wherein one outer leaf is separated from the main body of the book by one element of said outer leaf separating means.

FIG. 5B is a view similar to that of FIG. 5A, except that it shows the book in a more advanced position in its progress through the bookbinding machine, the opposite outer leaf being now shown separated from the main body of the book by an oppositely situated element of said outer leaf separating means.

FIG. 6 is a fragmentary side view showing certain details of the present invention.

FIG. 7 is a fragmentary view partly in section showing certain details of the invention.

FIG. 8 is an enlarged fragmentary transverse view, partly in vertical section, showing a book positioned at the outer leaf looping and folding station of the machine preparatory to the outer leaf looping and folding operations.

FIG. 9 is a view similar to that of FIG. 8, but illustrating the looping phase of the operation.

FIG. 10 is another view similar to that of FIG. 8 but showing a subsequent stage in the looping phase of the operation, preparatory to the folding phase.

FIG. 11 is still another view similar to that of FIG. 8, but showing the folding operation of the invention.

FIG. 12 is a fragmentary view, partly in vertical section, showing details of the looping and folding mechanism.
FIG. 13 is another fragmentary view, partly in vertical section, showing additional details of the looping and folding mechanism.

FIG. 14 is a fragmentary view, partly in horizontal section, showing details of the looping and folding mechanism.

FIG. 15 is an end view of a book showing a pair of end leaf assemblies secured thereto but prior to the outer leaf looping and folding operations.

FIG. 16 is a view of the book shown in FIG. 15 after the outer leaf looping and folding operations.

DESCRIPTION OF PREFERRED EMBODIMENT OF THE INVENTION

The machine which is shown in the drawing receives uncovered bound books 10 from a conventional source, such as a machine which binds (e.g. sews, staples or cements) the pages of the book together and attaches thereto a pair of end leaf assemblies 12 (also by sewing, stapling, cementing or the like). Bound books 10 include the end leaf assemblies in the sense that these assemblies are secured to the books, but the assemblies remain to be further processed (folded) and further secured to the books. The present invention is primarily directed to the process of folding and further securing the end leaf assemblies. More precisely, the invention is directed to the procedure whereby the outer leaves of the end leaf assemblies are first looped and then folded, and the folds are secured to the inner leaves of the end leaf assemblies and to the sides of the spine of the book.

Each bound book 10 is provided with a pair of end leaf assemblies 12, and each end leaf assembly consists of an inner leaf 14, an outer leaf 16, sometimes an intermediate leaf 18, and a connecting strip 20. The connecting strip is adhesively secured to the inner and outer leaves of the end leaf assembly, and it thereby interconnects said inner and outer leaves. If there is an intermediate leaf, it is usually an integral extension of the outer leaf, and hence the connecting strip interconnects all three leaves when it interconnects the inner and outer leaves. It will be understood that the inner leaves 14 of the end leaf assemblies are secured to the sides of the spine 10a of the book by adhesive 10b or any other suitable means. This is illustrated in Glasgow U.S. Pat. No. 3,533,646 issued on Oct. 13, 1970.

Before processing in the claimed machine, the outer leaves 16 extend beyond (above) the inner and intermediate leaves 14 and 18 of the end leaf assemblies, as well as beyond (above) the pages 10c of the book. In this orientation, the spine of the book faces downwardly and rests on a horizontal surface. The sides of the book and the leaves of the end leaf assembly extend in vertical planes.

With the foregoing as background, it will be understood that each bound book 10, with its end leaf assemblies secured thereto as described, is individually moved (pushed or otherwise conveyed) through the machine on horizontal track or other support 22. The movement is from left to right as viewed in FIG. 12. Horizontal track 22 is suitably supported on frame 24 as is the rest of the machine. Also, suitable side guides are provided along track 22 to support the book in vertical position, that is, with its spine 10a resting on said track and its pages and end leaves extending vertically. Illustrative of the book pushing means which may be used for this purpose is the book pushing or advancing means shown in Glasgow U.S. Pat. No. 3,478,378.

The advancing book moves across the paths of a series of light beams which are focussed upon a battery of photoelectric cells 26 mounted on a panel or box 28. These light beams emanate from a series of lamps 30 situated opposite said photoelectric cells. The height of the book (as viewed in FIG. 11), including the outer leaves of its end leaf assemblies, determines how many light beams will be interrupted, and, conversely, the number of interrupted light beams is an indication of the height of the book.

Through a circuit which is not herein claimed, the photoelectric cells are connected to a control mechanism 32 which adjusts the height of an outer leaf separating system 34 to the height of the book. This adjustment occurs as the book passes between photoelectric cells 26 and lamps 30 and interrupts such number of light beams as is determined by its height. Consequently, the outer leaf separating system 34 will be adjusted to the height of the book when the book reaches the outer leaf separating station.

There is another adjustment of the outer leaf separating system which is reached by the book.

This adjustment has to do with the thickness of the book and it occurs automatically as the book passes between the stationary side 34a and the movable side 34b of the outer leaf separating system 34. Movable side 34b is normally positioned adjacent stationary side 34a and is biased toward said stationary side by any conventional means, such as a counterweight 36 or the like.

An angularly disposed cam plate 38 is connected to the movable side 34b of the outer leaf separating system at the inlet end thereof. Opposite cam plate 38, on the stationary side 34a of the outer leaf separating system, is a fixed plate 40 occupying a plane which parallels the path of travel of the book. As the book moves through the machine, it wedges its way between plates 38 and 40, camming plate 38 away from plate 40, and thereby adjusting the spacing between the plates to correspond to the thickness of the book.

More specifically, movable side 34b of the outer leaf separating system includes a carriage 42 which is slidably mounted on a pair of spaced, parallel shafts 44 occupying a common horizontal plane and extending transversely of the longitudinal path of movement of the book. Connected to carriage 42 is a cable 46 which extends around pulley 48 rotatably mounted on the stationary side 34a of the outer leaf separating system. The opposite end of the cable is attached to counterweight 36 above mentioned. It is this counterweight which draws carriage 42 toward the stationary side 34a of the outer leaf separating system. It is against the bias of said counterweight that the camming action of the moving book is applied. Springs 50 on shafts 44 serve as cushions between the stationary and movable sides of the outer leaf separating system before a book enters between them and after the book leaves them.

It will now be observed that a frame member 52 supports the stationary side 34a of the outer leaf separating system. Included in said system, and supported by frame member 52, are plate 40 (above mentioned) and plate 54. In the path of travel of book 10 to and through the outer leaf separating station, plate 40 is first encountered and then plate 54. The terminal edge 40a of plate 40 is beveled and it extends along a line which is inclined relative to the vertical, for example, at an angle of 30 degrees. The leading edge 54a of plate 54 is correspondingly angled, as is a guide slot 56 formed in said plate 54. The orientation of beveled edge 40a (and
3,786,529

this is equally true of edge 54a and slot 56) is such that the lower end is farther advanced along the path of travel of the book. Stated differently, the upper end of the book first encounters said beveled edge 40a.

A slide (or carriage) 60 is movably mounted on plate 54 for movement along angled edge 54a of said plate. The directions of movement of said slide are indicated by double-headed arrow 62 shown in FIG. 2. Supporting slide 60 is a pair of rollers 64 which ride in slot 56. Also supporting slide 60 is a cable 66 which extends around pulley 70 and is connected to pulley 72 on housing 68. This housing is itself mounted on plate 54. Pulley 72 is connected to a motor drive in control mechanism 32 and it will be understood that this motor drive is energized and actuated in response to signals from the bank of photoelectric cells 26 above mentioned. More precisely, assuming that the starting position of slide 60 is adjacent the upper end of slot 56 (as indicated by interrupted lines 60a), the passage of a book of given vertical dimension across the panel of photoelectric cells will cause the control mechanism to lower slide 60 (by gravity) to a position corresponding to the height of the book.

Secured to slide 60 is an outer leaf deflector 74 which projects horizontally in the direction of the oncoming book. It will be understood from the foregoing description that as the book moves forwardly from the panel of photoelectric cells (rightward as viewed in FIG. 1), deflector 74 will engage the adjacent outer leaf 16 and deflect it against beveled edge 40a of plate 40 and behind plate 54, thereby spacing said outer leaf from the inner and intermediate leaves 14 and 18 of the same end leaf assembly. Positioned in back of plate 54 in spaced relation thereto is a back-up plate 76 for the outer leaf 16 last above mentioned. When deflector 74 deflects said outer leaf behind plate 54, the outer leaf actually passes between, and is guided by, plates 54 and 76.

On the opposite (movable) side 34b of the leaf separating assembly is a comparable leaf deflecting means. Specifically, supported by carriage 42 is a plate 80 which corresponds to plate 54 and a back-up plate 82 which corresponds to back-up plate 76. A guide slot 84 is provided in plate 80 to receive rollers 86 of slide (or carriage) 88 and it is by means of this guide that the slide is movably mounted on said plate 80. Slide 88 corresponds to slide 60 above mentioned, and deflector 90 on slide 88 corresponds substantially to deflector 74 except that it is the mirror opposite thereof.

Just as deflector 74 is engageable with the outer leaf on one side of the book, so is deflector 90 engageable with the outer leaf on the opposite side of the book. However, the two deflectors are situated in staggered positions relative to the path of movement of the book, and deflector 74 engages the outer leaf on its side of the book before deflector 90 engages the outer leaf on the opposite side thereof. Actually deflector 74 performs its function before the book wedges its way between the stationary and movable sides of the mechanism. Accordingly, it will be understood that this deflection occurs before the book is in compression. Deflection and separation of the outer leaf encountered by deflector 74 is thereby facilitated although the extent of compression is not substantial.

It is not until the book wedges its way between cam plate 38 of the movable side of the mechanism and plate 54 of the stationary side thereof, that the opposite outer leaf is engaged by deflector 90. However, it will be noted that a telescopic element 92 is pivotally connected at one end to deflector 74 and at its opposite end to deflector 90. This telescopic element functions in the manner of a cam which engages the outer leaf of the book on the movable side of the mechanism and guides it into engagement with deflector 90. As the book continues its advance through the machine, its last mentioned outer leaf passes behind deflector 90 and between plates 80 and 82. Once this occurs, the book is positioned between plate 54 on the stationary side of the mechanism and plate 80 of the mechanism, its outer leaves being held captive between plates 54 and 76 on the stationary side and plates 80 and 82 on the movable side.

In this connection it should be noted that deflectors 74 and 90 are always maintained on the same horizontal level. Just as deflector 74, and more particularly slide 60, is suspended from a cable 66 which is connected to a drive pulley 72, so is deflector 90, and more particularly slide 88, suspended from a corresponding cable 94 which extends around pulley 96. Pulley 96 is mounted on a splined shaft 98 which is connected to drive pulley 72. Pulley 96 is provided with splined engaging elements 100 which enable the pulley to move freely longitudinally of the splined shaft 98 but which lock said pulley to said shaft for unitary rotary movement therewith. It follows from the foregoing that slide 60 with its deflector 74 and slide 88 with its deflector 90 are always maintained in a common horizontal plane depending upon the signals which are received by control mechanism 32 from the panel of photoelectric cells 26. As deflector 74 descends to engage one of the outer leaves of a relatively short book (this being its vertical dimension when supported on its spine) so does deflector 90 descend at the same time and at the same pace to engage the other outer leaf of the same book.

At the conclusion of the operations above described, the book is properly supported for the next step in the procedure, namely, the step of forming loops 102 in the outer leaves of the end leaf assemblies of the book. The method and means for accomplishing this result will now be described.

Taking FIGS. 8, 9, 10 and 11 as the figures which best show the looping operation, as well as subsequent sequential operations, it is noted that there is a looping means 104 on the stationary side of the apparatus and corresponding looping means 106 on the opposite, movable side of the apparatus. These two looping mechanisms are substantially identical with each other except for the fact that looping mechanism 106 is adjustably movable toward and away from the book being processed while looping mechanism 104 is relatively stationary. As will shortly appear, it is adapted to provide a final adjustment with respect to the book but other than that it is a stationary unit.

Taking the stationary looping mechanism 104 first, it will be noted that it is mounted on a frame member 108 which supports it in fixed position on the machine. Looping mechanism 104 includes a pair of spaced vertically extending posts 110 and a housing 112 slidably mounted on posts 110 for vertical movement thereon. Hydraulic or pneumatic drive means 114 is provided to drive housing 112 in downward direction to perform the looping operation which will shortly be described. This action is opposed by compression spring 116 which serves to return housing 112 to its elevated position following the looping operation. Extending horizontally through housing 112 is a pair of shafts 118. Shafts 118 are slidably mounted in housing 112 for hor-
horizontal movement toward and away from the book which is being processed. At the forward or inner ends of shafts 118 is a plate 124 on which a pad 126 is mounted. It is this pad which engages the outer leaf of the book to form a loop therein in the process being described. A solenoid 120 or any conventional pneumatic, hydraulic or other drive means, acting against plate 124 advances said plate and pad 126 mounted thereon in the direction of the books being processed but, as will shortly appear, this is a minor movement for the purpose of engaging the outer leaf prior to looping. On the opposite side of the machine, that is its movable side, is the opposing-looping means 106. This looping means is mounted on a support 130 which, as will shortly be seen, is movably mounted. Like looping means 104, loop 106 includes a pair of posts 132 mounted on support 130, and carrying a housing 134. Hydraulic or pneumatic drive means 136 drives housing 134 downwardly against the action of spring 138. The spring serves to return the housing to its upper position. Looping device 106 is also provided with a plate 140 corresponding to plate 124 of looping device 104. However, plate 140 is directly secured to housing 134 and there is no relative movement between them. A pad 142 is mounted on plate 140.

It should be noted that extending across and below the looping section of the machine is a pair of shafts 144. Slidably mounted on said shafts is a pair of slide elements or carriages 146 and 148, respectively. These carriages are movable toward and away from each other and toward and away from a book placed between them. Carriage 148 plays a role in the looping operation as well as in the subsequent folding operations. Carriage 146 has nothing to do with looping, but it does function in connection with the folding operations.

The looping operation proceeds as follows:

When a book reaches the looping station as shown in FIG. 8, it is supported in upright position with its spine bearing against track 22, one outer leaf being supported between plates 54 and 76 and the other outer leaf being supported between plates 80 and 82. The only lateral pressure upon the book is supplied by counterweight 36 which draws plates 80 and 82 toward plates 54 and 76. It is now necessary to bring looping pads 126 and 142 into engagement with said outer leaves. For pad 126 this is achieved by moving carriage 148 and support 130 by drive means 154. Once said pad 142 engages said book's outer leaf, support 130 stops and carriage 148, continues a predetermined amount of travel allowing support 130, with looping means 106 to slide over shaft 131 against the bias of springs 133 and creating a predetermined amount of pressure over book's outer leaf against plate 80.

During the foregoing procedure, while looping housing 112 remains stationary, plate 124 and pad 126 will move forward by means of solenoid 120 engaging the books opposite outer leaf over plate 54 applying a pressure equal in amount but opposite in direction to the one exerted by pad 142 over plate 80.

The two pads 126 and 142 are now in operative frictional engagement with the outer leaves of the book. It will now be recalled that plates 54 and 80 serve as backing plates relative to these outer leaves, supporting said leaves against the pressure exerted by pads 126 and 142. It will be understood that said backing plates 54 and 80 extend downwardly in the direction of the spine of the book a sufficient distance to perform the back-up function with respect to said pads 126 and 142 for the full range of their looping operation which will now be described. It will further be understood that support plates 76 and 82 are foreshortened at their lower ends to enable said pads to gain access to said outer leaves. Hydraulic or pneumatic drives 114 and 136 now operate to move housings 112 and 134 downwardly a predetermined distance. Since plates 124 and 140 and there respective pads 126 and 142 are supported by said housings 112 and 134, such downward movement of the two housings produces a downward movement of said plates and said pads. Since the pads are in frictional engagement with the outer leaves of the book, and since the frictional coefficient between the pads and the outer leaves exceeds the frictional coefficient between the outer leaves and their respective backing plates 54 and 80, such downward movement of the two pads causes a downward sliding movement of the two outer leaves on their said backing plates, resulting in the formation of leaves 102 shown in FIG. 9 of the drawing. This concludes the looping operation and the book is now ready for the next phase or stage in the procedure, namely, that of pressing the loops downwardly and inwardly preparatory to the folding operation.

The loop pressing operation proceeds as follows: Carriages 146 and 148 are moved inwardly toward each other and toward the book by hydraulic or pneumatic drive means 152 and 154, respectively, or equivalent. It will be observed that mounted on carriages 146 and 148 are plates 156 and 158, respectively. These plates occupy a common horizontal plane a predetermined distance below the lowermost position of looping pads 126 and 142. This horizontal plane is located, as indicated in FIG. 9, adjacent the top of loops 102. Movement of carriages 146 and 148 toward each other will bring the two plates 156 and 158 in holding engagement with the outer leaves of the book immediately above their respective loops. This is shown in FIG. 10. It will also be noted that the plane which looping plates 156 and 158 occupy is below the lower edges of backing plates 54 and 80. Consequently, when plates 156 and 158 are brought to bear against the outer leaves of the book, they apply sufficient pressure to said outer leaves to hold them in fixed positions against the intermediate and inner leaves of the end leaf assemblies as well as against the pages of the book itself.

The book is now ready for the loop pressing operation. It will now be observed that plates 156 and 158 are supported on slides 160 and 162, respectively, said slides being mounted on telescopic supports 164 and 166, respectively. Compression springs 168 and 170 are disposed on telescopic elements 164 and 166 between the carriages and the slides, that is between carriage 146 and slide 160 and between carriage 148 and slide 162. Consequently, after plates 156 and 158 engage the outer leaves of the book and carriages 146 and 148 continue their inward movement toward each other, brackets 172 and 174 on telescopic elements 164 and 166 will continue to advance in the direction of the book although plates 156 and 158 and their respective slide supports 160 and 162 remains relatively stationary. Springs 168 and 170 are further compressed to exert the stronger force through plates 156 and 158 upon the outer leaves of the book.

Hingedly supported on brackets 172 and 174 are loop depressing elements 176 and 178 respectively. These loop depressing elements are somewhat rounded
on their facing surfaces and tapered to form a pair of oppositely disposed cam faces.

Engaging the free ends of hinged elements 176 and 178 are slides 180 and 182 respectively. These slides are backed up by compression springs 184 and 186 respectively, both the slides and the springs being carried by carriages 146 and 148. Continued inward movement of the two carriages toward each other will cause slides 180 and 182 to press against the free ends of hinged elements 176 and 178 and cause them to swing forwardly, that is, toward each other, as indicated in sequential FIGS. 10 and 11.

The effect of the foregoing is that hinged elements 176 and 178 press inwardly against the two loops 102 and squeeze (cam) them downwardly, with a wiping action, to flatten them against the sides of the book. See FIG. 11. Hinged elements 176 and 178 do not however engage the lowestmost ends of the flattened loops and consequently these elements do not provide the means for forming the desired folds in said outer leaves. The folding (creasing) function is performed by presser elements 190 and 192 in a portion which will now be described.

Presser elements 190 and 192 are provided on carriages 146 and 148 immediately below slide elements 180 and 182. These presser elements 190 and 192 may be integral parts of the carriages and they move integrally with them. The function is to engage the lowermost ends of the flattened loops and to press them against the sides of the spine of the book to provide folds 194 and 196 in the flattened looped portions of the outer leaves of the book. This is clearly shown in FIGS. 11 and 16 of the drawing.

The folding operation is now complete but it should be noted, and it will be understood from Glasgow U.S. Pats. Nos. 3,478,378 and No. 3,533,646, that these folds are adhesively secured to the sides of the book spine in order to properly secure the outer leaves to the book. Accordingly, it will be understood that at some earlier stage in the procedure herein described adhesive 101 is applied to connected strips 20 of the end leaf assemblies. This is done by conventional means and in conventional manner. The adhesive may be applied to that part of the connected strips which engages inner leaves 14 or that part which engages outer leaves 16 or both such parts. In any case, when the loops which are formed in the outer leaf (and in the attached portions of the connected strips) are flattened, and the folds pressed against the sides of the spine of the book, and more particularly the portion of the connected strip which is attached to the sides of the spine, the folds are adhesively secured to the book and the book is now ready for the final binding portion wherein its covers are applied and secured to it. This operation is described in Glasgow U.S. Pat. No. 3,478,378 but forms no part of the present invention.

The foregoing is illustrative of a preferred form of this invention and it will be understood that modifications and variations may be incorporated therein within the broad spirit of the invention and the broad scope of the appended claims.

What is claimed is:
1. In a bookbinding machine, an end leaf-folding mechanism, comprising:
   a. leaf-looping means, and
   b. loop-pressing means,
3,786,529

In a bookbinding machine, the combination of claim 5, wherein:

a. leaf-supporting plates are provided adjacent the outer sides of said leaf-backing plates in parallel relation thereto,

b. said outer leaves being supported between said leaf-supporting plates and said leaf-backing plates.

7. In a bookbinding machine, the combination of claim 5, wherein the loop-pressing means comprises:

a. leaf-positioning means which are adapted to engage the outer leaves above the loops formed in them and fix said outer leaves relative to the spine of the book,

b. loop-depressing means which are adapted to engage said loops and reduce them to relatively flat proportions, and

c. loop-folding means which are adapted to engage said relatively flat loops and press them against the sides of the spine of the book to form folds extending longitudinally of said spine.

8. In a bookbinding machine, the combination of claim 7, wherein the leaf-positioning means comprise:

a. a pair of leaf-gripping plates mounted on opposite sides of the parallel planes of the leaf-backing plates,

b. said leaf-gripping plates being aligned in a common plane perpendicular to said parallel planes of the leaf-backing plates and parallel to the plane of the book support,

c. said leaf-gripping plates being rectilinearly movable toward each other in their common plane to engage the outer leaves above their respective loops, and hold them in fixed positions against the main body of the book.

9. In a bookbinding machine, the combination of claim 7, wherein the loop-depressing means comprises:

a. a pair of hinged pads mounted on opposite sides of the parallel planes of the leaf-backing plates below said leaf-positioning means,

b. the hinge axes of said hinged pads being parallel to each other, and being also parallel to said parallel planes of the leaf-backing plates and the perpendicular plane of the book support,

c. said hinged pads being swingable toward each other to engage the loops formed in the outer leaves and to press them to relatively flat proportions.

10. In a bookbinding machine, the combination of claim 7, wherein the loop-folding means comprise:

a. a pair of rams mounted on opposite sides of the parallel planes of the leaf-backing plates below said loop-depressing means,

b. said rams being aligned in a common plane perpendicular to said parallel planes of the leaf-backing plates and parallel to the planes of the book support,

c. said rams being rectilinearly movable toward each other in their common plane to engage the flattened loops and to press them against the sides of the spine of the book to form folds extending longitudinally of said spine.

11. In the process of binding a book, a method of folding the outer leaves of end leaf assemblies wherein the outer leaves are secured to the inner leaves by means of a connecting strip which parallels the spine of the book, said method comprising the steps of:

a. placing a leaf-backing plate behind the outer leaf of each end leaf assembly,

b. sliding the outer leaf on said leaf-backing plate in the direction of the connecting strip of the end leaf assembly and the spine of the book,

c. thereby forming a loop in the outer leaf paralleling said connecting strip and spine, and
d. squeezing the loop to form a fold in the outer leaf paralleling said connecting strip and spine.

12. The method of claim 11, wherein:

a. the loop is formed in both the outer leaf and connecting strip of each end leaf assembly, and

b. the loop is squeezed to fold both said outer leaf and said connecting strip.

13. The method of claim 11, wherein:

a. the loop is formed in both the outer leaf and connecting strip of each end leaf assembly, and

b. the loop is pressed against the side of the spine to form a single fold in the outer leaf and double folds in the connecting strip,

c. all of said folds being formed in parallel relationship,
d. the double folds in the connecting strip being oppositely oriented to form overlapping layers.

14. The method of claim 13, wherein:

a. adhesive is applied to the connecting strip prior to the loop-pressing operation,

b. said connecting strip being folded upon itself in said loop-pressing operation,

c. thereby securing said overlapping layers to each other by means of said adhesive.

15. A bookbinding and rebinding method, comprising the steps of:

a. providing an assembly of book pages bound in the back to form a spine,

b. attaching the inner leaf of an end leaf assembly to each side of the book page assembly along its bound back,

c. inserting a leaf-backing plate behind the outer leaf of each such end leaf assembly,

d. sliding said outer leaf on said leaf-backing plate toward the spine of the book page assembly to form a loop in said outer leaf extending along said spine,

e. pressing said loop along its length to flatten it and form a fold in said outer leaf extending along said spine,

f. securing said outer leaf fold to the inner leaf, and

g. attaching a cover and back assembly to said outer leaves to encase the bound book page assembly.

16. The method of claim 15, wherein:

a. a leaf-supporting plate is placed on the outside of the outer leaf of each end leaf assembly in spaced parallel relation to the leaf-backing plate behind said outer leaf,

b. thereby supporting both sides of said outer leaf.