July 23, 1957 C. SCHRAMM 2,800,095

LOOPING MECHANISM FOR BOOK STITCHING MACHINE

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FIG. 1

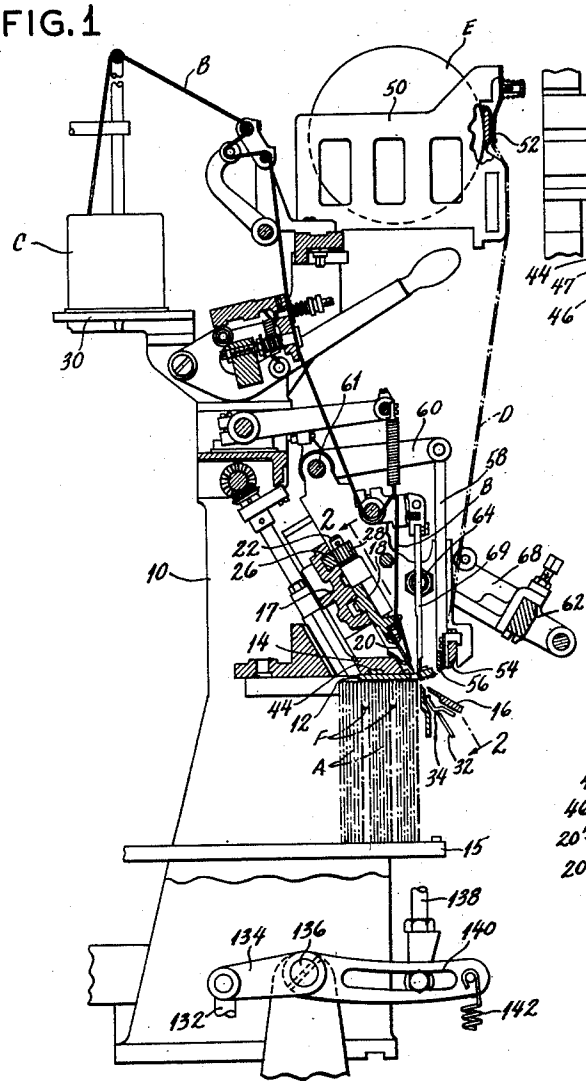


FIG. 2

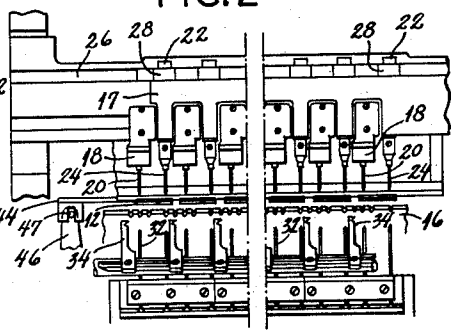


FIG. 3

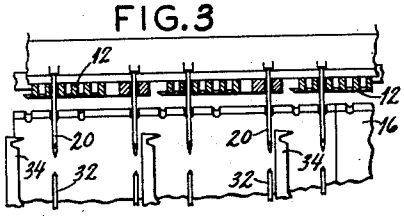


FIG. 4

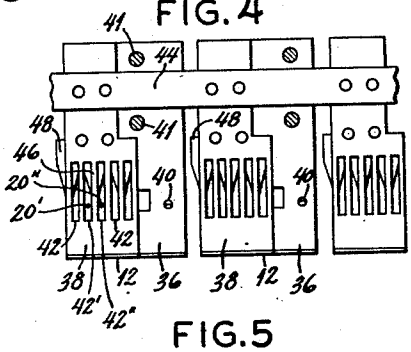


FIG. 5

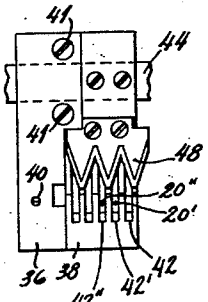


FIG. 6

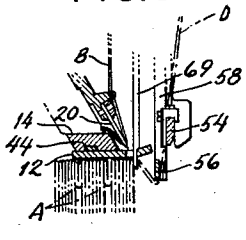
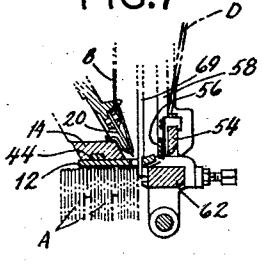


FIG. 7



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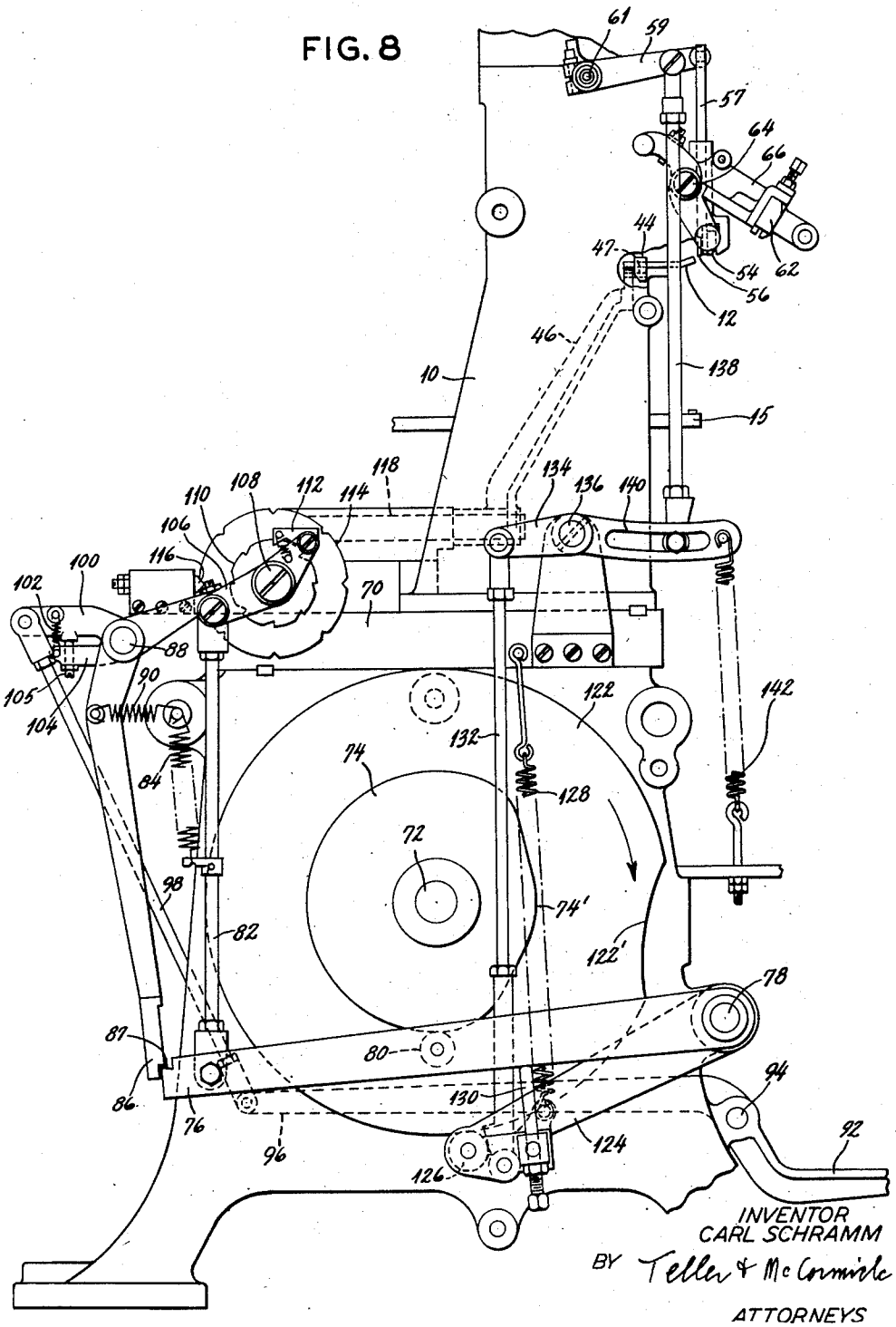
ATTORNEYS

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LOOPING MECHANISM FOR BOOK STITCHING MACHINE

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FIG. 8



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LOOPING MECHANISM FOR BOOK STITCHING MACHINE

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Application November 21, 1955, Serial No. 548,156

3 Claims. (Cl. 112—21)

The invention relates generally to a cyclically operable book stitching machine of the type wherein successive book signatures are fed to a stitching position with their backs facing upwardly and thereafter beyond said position along a signature guideway, wherein tapes are fed simultaneously with the signatures so that said tapes lie transversely across the backs of the signatures, wherein each signature at said stitching position and the corresponding portions of the tapes are stitched to provide stitching that extends along the tapes and cooperates with said tapes to connect the several adjacent signatures constituting one stitched book and wherein there is a mechanism for cutting the threads of the stitching that would otherwise connect the last signature of a stitched book with the next following signature. The invention relates more specifically to mechanism connected for at least semi-automatic operation in synchronism with said thread cutting mechanism and adapted for engaging said tapes to form loops therein that are between the last signature of each stitched book and the next following signature.

The drawings show in detail a preferred embodiment of the invention, but it will be understood that various changes may be made from the construction shown and that the drawings are not to be construed as defining or limiting the scope of the invention, the claims forming a part of this specification being relied upon for that purpose.

Of the drawings:

Fig. 1 is a combined side and vertical sectional view, partly schematic, of the upper portion of a book stitching machine embodying the invention.

Fig. 2 is a fragmentary view on a slightly reduced scale taken along the line 2—2 of Fig. 1.

Fig. 3 is a fragmentary view similar to Fig. 2 but on a larger scale, this view showing some of the parts in different relative positions.

Fig. 4 is a top view of some of the presser plates.

Fig. 5 is a bottom view of one presser plate.

Fig. 6 is a fragmentary view similar to a portion of Fig. 1 but showing some of the parts in different relative positions.

Fig. 7 is a fragmentary view similar to Fig. 6 but showing some of the parts in still different relative positions.

Fig. 8 is a side view of the lower portion of a book stitching machine embodying the invention, the upper part of this view showing some of the same parts shown in the lower part of Fig. 1.

Except for the semi-automatic tape looping mechanism to which the invention more particularly relates, the machine is of known construction and a brief description will suffice. Referring more particularly to Figs. 1 to 7, the machine comprises an upper frame **10** which may be a casting. Secured to the frame **10** in central position are several presser plates **12** supported by a fixed transverse bar **14**. Signatures A, A are fed under the presser plates and toward the left, said signatures being supported on longitudinal rails **15** which constitute a signature platform or guideway. The presser plates **12** and the stitching mechanism associated therewith are hereinafter more fully described.

The signatures A, while partly open, are successively fed transversely onto a movable signature arm or saddle **16** which successively supports said signatures in a predetermined stitching position. During each cycle, the saddle is in the position shown in Fig. 1 for the stitching of the signature carried thereby. The saddle has an inverted V-shape and when in stitching position its apex is close to the presser plates. After the stitching operation the saddle is swung forwardly and downwardly so as to free the stitched signature and receive a new signature and it is then returned to said stitching position.

As shown in Figs. 1 and 2, a needle cross head **17** is located above the presser plates **12**, and this cross head is reciprocable along a path that is inclined upwardly and rearwardly. Carried by the cross head **17** is a plurality of needle blocks **18** each carrying a needle **20**. Also carried by the cross head **17** are rotatable arbors **22** to the lower end of each of which is attached a hook **24** which cooperates with an adjacent needle in the stitching operation. Each arbor **22** and the hook **24** thereon is rotated or oscillated by a transversely reciprocable rack **26** meshing with a pinion **28** on said arbor. Threads B extend from spools or cops C on holders **30** and over and through suitable guiding and tensioning means to the several needles **20**.

As best shown in Figs. 2 and 3, the several needles **20** and the several hooks **24** are reciprocated through holes in a similar number of presser plates **12**. The needles and hooks also pass through holes in the top of the signature arm or saddle **16**. Cooperating with the needles and hooks below the presser plates **12** and within the before-mentioned swinging V-shaped saddle **16** are punches **32** and loopers **34**. The punches and loopers are carried by said saddle and they are actuated at proper times by known mechanisms. The punches **32** are reciprocated upwardly and downwardly for piercing holes in the signatures for the passage of the needles and hooks, and the loopers **34** are moved transversely at the proper times to cooperate with the needles and hooks in the stitching operation. The action of said needles, hooks and loopers is such as to produce chain stitching that connects the several signatures constituting a book.

For cutting or severing the threads that would otherwise connect the last signature of a book with the next following signature, a suitable thread cutting means is provided and this is preferably a means such as disclosed in my Patent No. 1,995,754 dated March 26, 1935.

Each presser plate **12** consists of two complementary sections **36**, **38**. The presser plate section **36** has a hole **40** which permits the passage through it of a hook **24** and it is fastened to the under side of the presser plate bar **14** in a permanent position, as for instance by means of screws **41**. The presser plate section **38** has slots **42**, **42** for the passage through it of a corresponding needle **20** and this presser plate section is fastened to a bar **44** that is reciprocable in a transverse groove in the under side of the presser plate bar **14**, this bar connecting all of the movable sections **38** of the presser plates. The bar **44** may be moved first in one direction and then, after a dwell, in the opposite direction by a lever **46** actuated by means to be hereinafter fully described. The lever **46** carries a pin **47** which enters a notch in a block attached to said bar **44**.

Each hook **24** reciprocates through the hole **40** in the corresponding fixed presser plate section **36**, and the needle **22** reciprocates through one of the slots **42**, **42** in the corresponding movable presser plate section **38**.

The particular slot through which the needle reciprocates depends upon the adjustment of the needle and upon the location of said movable presser plate section. As illustrated in Fig. 4 of the drawing, one needle would normally reciprocate through the slot **42'** in the position **20'**. However, when the movable section **38** of the presser plate is moved transversely away from the fixed section **36**, the needle would reciprocate through the next slot **42''** in the position **20''**. Upon such movement of the presser plate section **38**, the thread carried by the needle would be looped over the division **46** between the slots 42' and 42''. The shift first in one direction and then in the opposite direction of the movable sections **38** of the several presser plates **12** is effected immediately following the stitching of the last signature of each book.

Atttached to the under face of each movable section **38** of the presser plates is a series of V-shaped blades **48**, the cutting edges of which diverge toward the rear. Threads looped over one of the divisions **46** between the needle slots **42'** and **42''** are drawn back as the signatures are stitched and pushed rearwardly and such threads are eventually severed by the inclined edges of the blade **48**. This, however, does not occur until several signatures have been stiched and pushed rearwardly, and thus the threads will not pull out, nor will the signatures loosen, when the signatures of one stitched book are separated from those of the next following book. Said blades **48** and said movable presser plate sections **38** collectively constitute the before-mentioned thread cutting means. It will be observed that said means is near the stitching position and near the entrance to the horizontal guideway for the stitched signatures. The mechanism for operating said thread cutting means is hereinafter described.

Several tapes D are interposed between the bottom of the presser plates **12** and the tops or backs of the signatures A, A, said tapes extending from front to rear and being so positioned that they are stitched in place simultaneously with the stitching of the signatures. The tapes serve to reinforce the stitching and thus serve to more securely connect the several signatures that constitute a book. The tapes are fed from coils E in holders **50**, suitable tensioning devices being provided at **52** and a stationary horizontal guide bar being provided at **54**.

Cooperating with the guide bar **54** is a closely adjacent horizontal looper bar **56**, the tapes being guided between said bars. The looper bar **56** is vertically movable, being carried at its ends by vertical links **57** and **58** which depend from arms **59** and **60** secured to a horizontal rock shaft **61**. The link **57** and the arm **59** are shown in Fig. 8 and the link **58** and the arm **60** are shown in Fig. 1. The looper bar **56** is normally in its upper position as shown by full lines in Fig. 1, and the tapes are merely fed between the bars **54** and **56** to lie along the tops or backs of the signatures as they are pushed rearwardly along the guideway **15**. However, when the number of signatures required for a book have been fed and stitched, the looper bar **56** is moved momentarily downwardly to the position shown in Fig. 6. The downward movement of the bar **56** serves to position additional lengths of tapes adjacent the last stitched signature, corresponding lengths of tape being withdrawn from the coils E. The movement of the next signature to the stitching position serves to press said additional lengths of tapes to form downwardly extending loops F, F between adjacent signatures, that is, between the last signature of one stitched book and the first signature of the next following book. For convenience of illustration, the thickness of the tape D is exaggerated in Figs. 1, 6 and 7 of the drawings and the thicknesses of the loops F and the widths of the spaces between adjacent stiched books are correspondingly exaggerated. The looping bar **56** and the parts for operating it as described are sometimes herein referred to as looping mechanism.

During each cycle of operation of the machine a signature A is delivered to the movable saddle **16** and the signature is supported by said saddle until it is stitched as described. After stitching, and as before stated, the saddle is swung forwardly and downwardly to free the stitched signature. Immediately following the last said movement of the saddle, the looper bar is moved as before described to form the tape loops. Immediately after the return of the looper bar to its normal upper position, a push back bar **62** is pivotally moved downwardly and rearwardly from the position shown in Fig. 1 to the position shown in Fig. 7, said bar moving about a horizontal pivotal axis at **64**. The push back bar is carried by arms **66** and **68** at its ends, the arm **66** being shown in Fig. 8 and the arm **68** being shown in Fig. 1. Said push back bar **62** engages the newly stiched signature and pushes it rearwardly. As soon as the signature has been pushed back, a plurality of hold back rods **69** move downwardly in unison through holes in the presser plates **12** to hold the signature in its last said position, the push back bar **62** being then returned to its position of rest as shown in Fig. 1. The hold back rods **69** remain in their lower positions until a new signature is moved into stitching position by the movable saddle **16** and they are then raised. After the stitching of each signature, the stitched signature is pushed rearwardly or backwardly along the guideway **15** by the next following signature advanced by the push back bar **62**. The stationary tape guide bar **54** is so located that it is above the path of movement of the push back bar **62**. The supports for said guide bar **54** are so spaced as to be between the pivoted arms **66** and **68** that carry the push back bar **62**. Thus the guide bar and its supports do not interfere with the movement of the push back bar.

Referring more particularly to Fig. 8, it will be seen that the machine includes a lower frame or base **70** which carries the said upper frame **10**. Mounted in suitable bearings in the base **70** is a rotatable main shaft **72** making one revolution during each cycle. By means of known mechanism connected with the shaft **70**, the signature feeding mechanism, the stitching mechanism and other parts of the machine are operated in the proper cyclic relationship.

Secured to the drive shaft **72** near the left end thereof is a cam **74** having a concentric outer portion and a relatively short low point or recessed portion **74'**. A lever **76** is positioned adjacent the cam, said lever being pivotally movable about the axis of a transverse horizontal shaft **78** and having a normal lower inoperative position. The lever **76** carries a roller **80** that is engageable with said cam **74**, the lever being in its said lower normal inoperative position when the roller engages the concentric portion of the cam. An approximately vertical link **82** is pivotally connected at its lower end with the lever **76**. The link **82** and the lever **76** are biased upwardly by a spring **84** connected to said link. A latch **86** having a tooth entered in a notch **87** in said lever **76** normally prevents any substantial upward movement of the lever, even when the roller **80** is disengaged from the concentric portion of the cam. The latch **86** is connected with the left end of a transverse horizontal rock shaft **88**, and said latch **86** is so connected with said shaft that it has limited lost motion relatively to said shaft. A spring **90** biases the latch forwardly into its lever retaining position.

A foot treadle **92** at the front of the machine, and preferably near the center thereof, is pivotally movable about a transverse horizontal axis at **94**. The treadle **92** has a rearward extension **96** pivotally connected with a link **98** which extends upwardly and rearwardly. The upper rear end of the link **98** is connected with an arm **100** on the shaft **88**, preferably near the center of said shaft. When the treadle is pressed downwardly, the link **98** is moved upwardly and rearwardly and the arm **100** and the shaft **88** and the latch **86** are moved clockwise in opposition to the spring **90** so that the latch is out

of lever engaging position. The link **98** and the arm **100** are moved upwardly in opposition to a spring **102** connected at its lower end to a stationary member **104**, said spring cooperating with the spring **90**. As soon as pressure on the treadle **92** is released, the spring **102** returns the parts other than the latch to the positions shown in Fig. 8. An adjustable screw **105** carried by the stationary member **104** serves as a stop to limit the return movements of the last said parts. The before-mentioned lost motion connection between the latch **86** and the shaft **88** permits said latch to initially abut against the end of the lever **76**, instead of having its tooth entered in the lever notch **87**.

The lever **76** does not immediately move upwardly after movement of the latch **86**. With the cam **74** in the position shown the lever **76** cannot move upwardly, but it is so moved by the spring **84** as the low point **74'** of the cam moves to roller engaging position. Thereafter the roller **80** and the lever **76** are moved downwardly by the cam and when they reach their lowermost positions the latch **86** has been released and has returned to its operative position.

The upper end of the link **82** is connected with a lever **106** mounted to oscillate about the axis at **108** of a transverse horizontal axis which is not shown. A ratchet wheel **110** is secured to the last said shaft and the lever **106** carries a spring actuated pawl **112** which is engageable with the teeth of the ratchet wheel. As the link **82** is moved upwardly by the spring **84** under the control of the cam **74**, the pawl **112** is moved clockwise from the position shown in Fig. 3 so as to engage the next ratchet tooth. When the lever **76** and the link **82** are returned downwardly by the cam **74**, the pawl **112** moves the ratchet wheel **110** counterclockwise through an angle equal to the angle between two adjacent ratchet teeth. Preferably a detent wheel **114** is connected with the ratchet wheel **110** and with the shaft therefor, said wheel **114** having peripheral notches corresponding in number to the ratchet teeth on the wheel **110**. A spring-pressed detent **116** is adapted to enter the notches in the wheel **114** so as to tend to retain the ratchet wheel and its shaft in the positions to which they are moved by the pawl **112**.

Connected to the transverse shaft that carries the wheels **110** and **114** is a multiple lobed cam, not shown, which serves upon each partial rotation of said shaft and by means of a lever, not shown, to oscillate a longitudinal horizontal rock shaft **118**. Secured to the shaft **118** is the before-mentioned lever **46** having engagement at its upper end by means of the pin **47** with the transversely movable bar **44** carrying the presser plate sections **38**.

From the foregoing description it will be apparent that upon each downward movement of the treadle **92**, the cam **74** acts at the proper point in the cycle to cause the movement of the lever **74** and the link **82** downwardly so as to operate the thread cutting means and thus initiate the cutting of the threads. The described parts constitute control mechanism for operating the thread cutting means.

A second cam **122** is secured to the main drive shaft **72** adjacent the cam **74**. A second lever **124** is pivotally movable adjacent said cam **122** and said second lever is preferably movable independently of the lever **76** about the axis **78**. The lever **124** carries a roller **126** which is engageable with the periphery of the cam **122**. The lever **124** and the roller **126** are biased upwardly by a spring **128**. The lever **124** carries a device normally engaging said lever **76** to maintain said lever **124** in a lower normal inoperative position when said lever **76** is in its lower inoperative position. Said device preferably is an adjustable stop screw **130** which is adapted to abut at its upper end against the bottom of the lever **76**. With the lever **124** in its lower inoperative position the roller **126** engages only the outer concentric portion of the cam **122** and the cam does not move the said lever.

An approximately vertical link **132** is pivotally connected at its lower end with the lever **124** and is pivotally connected at its upper end with the rear end of a lever **134**. The lever **134** is mounted between its ends for pivotal movement about a transverse horizontal axis at **136**. An approximately vertical link **138** is pivotally connected at its lower end with the front portion of the lever **134** and is pivotally connected at its upper end with the before-mentioned lever **59**. Preferably the lever **134** is provided with a longitudinal slot **140** so that the pivotal connection for the link **138** may be longitudinally adjusted. Thus the extent of movement of the link **138** may be varied through a considerable range. Preferably a spring **142** is provided for biasing the lever **134** in the clockwise direction, this spring supplementing the action of the spring **128**. The looping bar **56** and the described parts for operating it constitute looping mechanism.

So long as substantial upward movement of the lever **76** is prevented by the latch **86**, the lever **124** is retained in its lower position and the looping bar **56** is retained in its upper position, as shown in Figs. 1 and 8. When the lever **76** is released and moves upwardly to effect the cut-off of the threads as previously described the lever **124** is no longer held by said lever **76** and the lever **124** is free to move upwardly when permitted by the cam **122**. When the recessed portion **122'** of the cam **122** reaches the roller **126**, the lever **124** and the link **132** are moved upwardly and the lever **134** is moved in the clockwise direction, these parts being moved by the springs **128** and **142**. When the lever **134** is moved clockwise, the link **138** is moved downwardly, thus moving the arm **59** and the shaft **61** and the arm **60** in the clockwise direction. As the arms **59** and **60** move in the clockwise direction, the links **57** and **58** move downwardly to cause the looping bar **56** to move downwardly to the Fig. 6 position so as to effect looping in the manner previously described. Then the cam **122** returns the parts to their normal positions, the looping bar being in its upper position. When the lever **76** is restored to its normal lower position, the stop screw **130** prevents further movement of the looping mechanism until said lever **76** is again released for upward movement.

In operation, the machine acts during each cycle to feed and stitch a signature in the manner described, the tapes D being stitched simultaneously with each signature. At a short interval before the stitching of the last signature of a book the operator presses the treadle **92** and thus initiates the operation of the control mechanism that causes the thread cutting means to cut the threads that would otherwise connect the last signature of the stitched book with the next following signature. The pressing of the treadle merely subjects the control mechanism to the action of the cam **74** and the actual timing is controlled by said cam. When the cam causes movement of the lever **76**, the bar **44** is moved transversely and the blades **48** eventually cut the threads, all as previously explained.

Substantially simultaneously with the initiation of the operation of the said control mechanism, the tape looping mechanism is operated to form the downwardly extending tape loops F, F. More specifically, the upright movement of the lever **76** of the control mechanism frees the lever **124** of the looping mechanism so that the last said lever is subjected to the action of the cam **122** and the actual timing of the looping action is controlled by said cam in automatic synchronism with the action of the cutting means.

The invention claimed is:

1. In a cyclically operable book stitching machine of the type wherein successive book signatures are fed to a stitching position with their backs facing upwardly and thereafter beyond said position along a signature guideway and wherein tapes are fed simultaneously with the

signatures so that said tapes lie transversely across the backs of the signatures and wherein each signature when at said stitching position and also the corresponding portions of the tapes are stitched to provide stitching that extends along the tapes and cooperates with said tapes to connect the several adjacent signatures constituting one stitched book, the combination of thread cutting means located near said stitching position and near the entrance end of said signature guideway, control mechanism for causing said thread cutting means to operate after the stitching of the last signature of a stitched book so as to cut the threads that would otherwise connect said last signature with the next following signature, a horizontal looping bar normally located above the paths of movement of said tapes to said stitching position which bar is vertically movable to engage said tapes, and looping mechanism connected for operation in automatic synchronism with said control mechanism and serving to cause downward and upward movement of said looping bar after the stitching of said last signature of a stitched book and before the movement of the next following signature to said stitching position so that said bar forms downwardly extending tape loops that are between said last signature of said stitched book and said next following signature.

2. A book stitching machine as set forth in claim 1, wherein there is a main shaft making one revolution during each cycle, wherein the control mechanism for the thread cutting means includes a cam on said shaft and includes a lever which has a normal inoperative position and is adapted to be moved from said position as the result of the movement of said cam, said lever when so moved serving to cause the operation of said cutting

means, wherein there is a latch having a normal position in which it prevents movement of said lever substantially out of its said normal inoperative position, wherein there is a means operable after a plurality of cycles for moving said latch so as to release said lever for movement as aforesaid out of its inoperative position so as to cause the operation of said cutting means, and wherein said looping mechanism includes a device engaging said lever in its said normal inoperative position to prevent operation of said looping mechanism which device releases said looping mechanism for operation when said lever is released for movement after the said plurality of cycles.

3. A book stitching machine as set forth in claim 2, wherein the looping mechanism includes a second cam on said shaft and includes a second lever which has a normal inoperative position and is adapted to be moved from said position as the result of movement of said second cam, said second lever when so moved serving to cause the operation of said looping mechanism, and wherein said second lever carries a device normally engaging the first said lever to maintain the second lever in its said normal inoperative position when the first lever is in its said normal inoperative position so that said looping mechanism is prevented from operation except upon operation of the control mechanism for the thread cutting means.

References Cited in the file of this patent

UNITED STATES PATENTS

924,274	Rich	June 8, 1909
1,995,754	Schramm	Mar. 26, 1935
2,027,105	Kleinschmit et al.	Jan. 7, 1936