Jan. 14, 1969 W. F. MAREK ET AL 3,421,465

THREAD TRIMMING DEVICE

Filed Feb. 21, 1967 Sheet 1 of 3

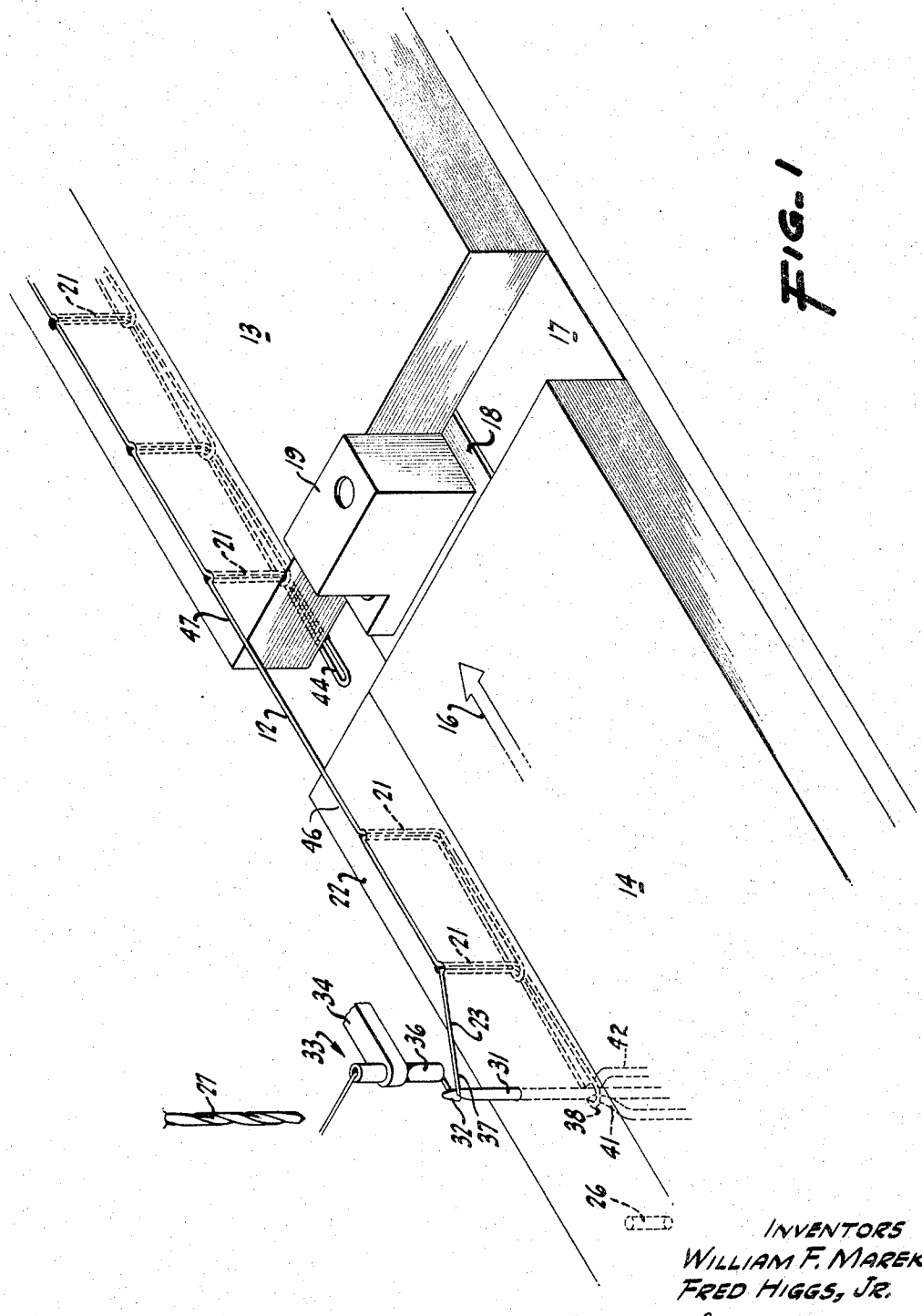


FIG. 1

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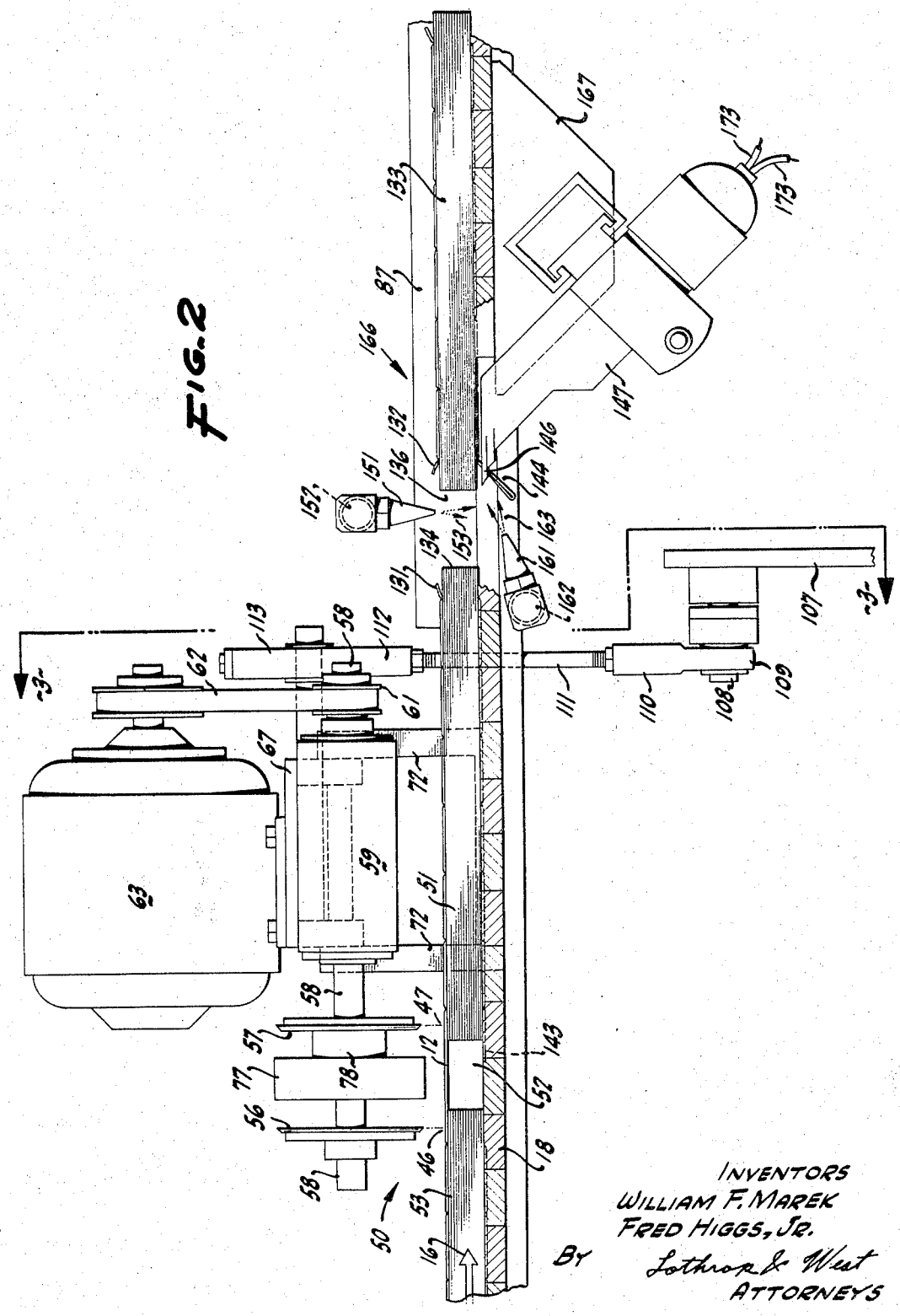
BY Lothrop & West
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FIG. 2



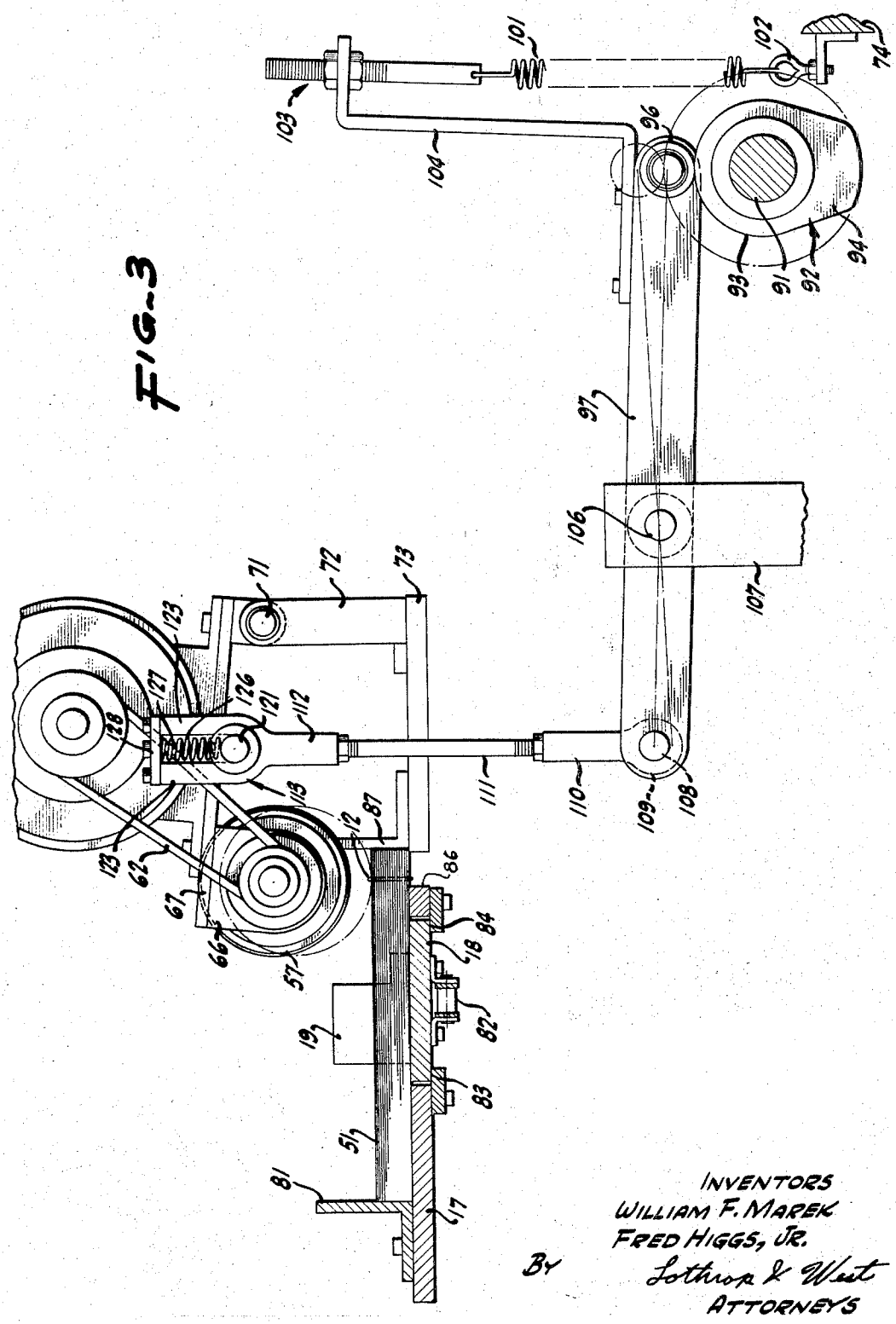
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FIG-3



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THREAD TRIMMING DEVICE

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Int. Cl. D05b 65/00

ABSTRACT OF THE DISCLOSURE

The disclosure relates to an attachment for an automatic book sewer, such as a "McCaine Sewer," utilizing a single thread chainstitch for sewing the side of a book. The attachment is effective automatically and continuously to trim away the upper thread and the lower loop left by the book sewing operation.

The invention relates to improvements in devices for trimming the excess connecting threads and loops from books which have been side sewn.

For purposes of economy, many books are manufactured using side sewing equipment wherein a single thread chainstitch is utilized to sew pages together along one side.

Automatic equipment, such as the "McCaine Sewer," has long been known and used for this purpose. The collated printed pages of the book are fed lengthwise into the side sewing equipment. Evenly spaced holes are thereupon drilled vertically through the book, followed by stitching. Upon emerging from the sewer, a top thread connects each of the books, and along the trailing lower edge of each book a thread loop remains. These connecting threads and thread loops are undesirable.

In times past, it has been necessary to provide one or more attendants to trim these excess threads. This task is not only onerous but has increased production costs.

It is therefore an object of the invention to provide an automatic thread trimming device which eliminates the need for such attendants and which lowers manufacturing costs accordingly.

It is another object of the invention to provide a trimming machine which requires but a relatively small amount of space, and which can readily be installed either as factory equipment or on existing installations.

It is a further object of the invention to provide a trimmer which is durable and long-lived, and is reliable and flexible in operation in that it can readily be adjusted to suit a wide range of book sizes.

It is yet a further object of the invention to provide a trimmer which is relatively economical both with respect to initial cost and to upkeep, and whose operation can readily be learned even by unskilled personnel.

It is another object of the invention to provide a generally improved thread trimming device.

Other objects, together with the foregoing, are attained in the embodiment described in the following descripition and shown in the accompanying drawings in which:

FIGURE 1 is a fragmentary, enlarged, perspective view of a conventional side stitching mechanism showing a previously stitched book being urged forwardly by an upstanding spacer lug mounted on a conveyor and illustrating the excess bottom loop together with the excess upper connecting thread extending back to the book presently being stitched;

FIGURE 2 is a fragmentary front elevational view of the thread and loop trimming device of the invention; and,

FIGURE 3 is a fragmentary side elevational view thereof, with portions being shown in section, the planes of the view being shown by the line 3—3 in FIGURE 2.

While the device of the invention is susceptible of numerous physical embodiments, depending upon the environment and requirements of use, the embodiment shown and described herein has been extensively tested and used and has performed in an eminently satisfactory manner.

FIGURE 1 illustrates the book stitching station. This station forms no direct part of the present invention and is therefore not described in detail. It is shown to depict certain important parts of a piece of sewing equipment with which the device of the invention has successfully been utilized to trim away the upper thread portion **12** connecting a leading book **13** and a trailing book **14** moving through the machine in the direction of the arrow **16**.

As will be appreciated, a "run" would ordinarily involve many hundreds or even many thousands of books, each of which undergoes the conventional stitching operation shown in FIGURE 1, followed by the thread and loop trimming operations effected by the device of the present invention and shown in FIGURES 2 and 3.

After collation of the printed pages, the books are placed lengthwise on an elongated table **17**, the books being also partially supported by a longitudinal conveyor **18** provided with upstanding flights **19**, or spacer lugs, or book advancing lugs, detachably and adjustably secured to the conveyor to accommodate differing book sizes.

Each book is urged forwardly by its own spacer lug, the distance or gap between the books being thereby carefully controlled. By appropriate timing mechanism, not shown, the intermittent start and stop movement of the conveyor **18** is also nicely regulated so as to afford the proper sequence with respect to drilling of the vertical holes **21** along the inner side **22** of the book, and the chainstitching of the thread **23** in the manner shown.

Customarily, a bottom drill, not shown, drills upwardly through the sheets approximately one half the thickness of the book so as to form a bottom hole **26**. Thereafter, a top drill **27** descends, while the conveyor has temporarily been stopped, and drills through the upper half of the book in alignment with the previously drilled lower hole **26** so as to form the throughbores **21**.

At the appropriate point in the cycle, a needle **31** with a barb **32** is projected upwardly through the hole **21**, the thread **23** being thereupon looped oved the barb **32** by a looper **33** comprising a looper bar **34** and a looper tube **36**, or thread guide, moving orbitally in a horizontal plane and carrying the thread with it, the thread being fed from a large bobbin, not shown.

In timed sequence the needle descends, carrying with it a loop **37**, the loop **37** being carried through a previously formed lower loop **38** held in place by the conventional cast off **41** located temporarily adjacent the bottom of the book. A needle brace **42** is also customarily provided.

After the upper loop **37** is carried down through the lower loop **38** by the barb, the needle, together with the cast off and the brace, continue to descend, forming a long thread loop. The book then moves ahead relative to the needle until the next hole is reached and the needle ascends. The loop **37** at this juncture corresponds to the previously described lower loop **38** and the cycle is repeated.

Owing to the provision of a conventional stitch cut-out mechanism, not shown, which is actuated when the gap occupied by the book positioning lug **19** is reached, all of the steps of the foregoing cycle are not taken. Instead, a residual loop **44** is formed on the lower trailing end of the book and must subsequently be trimmed off. So, also, the useless and undesirable upper thread portion **12**, must be trimmed off between approximately the two locations indicated by the reference numerals **46** and **47**.

In the trimmer of our invention, we prefer first to effect trimming of the upper thread **12**, this operation being accomplished at an upper thread trimming station **50**.

As appears most clearly in FIGURE 2, a leading book **51** is connected by the upper thread **12**, which extends across the gap **52**, to a trailing book **53**. Cutting of the upper thread **12**, at the desired locations **46** and **47** is effected by a spaced pair of rapidly rotating cutting wheels **56** and **57** mounted on a spindle **58**, or shaft, journaled in a horizontal bearing **59**.

The nether end of the shaft **58** extends beyond the bearing and is provided with a pulley **61** driven by a belt **62** connected to an electric motor **63**.

The cutting wheels **56** and **57** are capable of being selectively located axially on the shaft **58** so as to accommodate to books of various sizes.

Movement of the rapidly rotating wheels **56** and **57** from the spaced location shown in FIGURE 2 (and in full line in FIGURE 3) into cutting engagement with the thread **12**, as shown in broken line in FIGURE 3, is effected by mounting the bearing **59**, as by brackets **66** on a rocker plate **67**.

The rocker plate **67** is, in turn, pivotally mounted on a pin **71** carried by a spaced pair of arms **72** upstanding from a base plate **73**, secured to framework **74**. The electric motor **63** is secured to the rocker plate **67** and thus moves in unison with the bearing **59** and the spindle **58** as the cutting wheels **56** and **57** move intermittently and in timed sequence toward and away from the underlying sides of the books. Customarily, the timing is so arranged that the cutters descend each time the conveyor stops to allow the holes to be drilled.

As will be appreciated, however, it is not desired to cut the upper thread at any location other than at the points **46** and **47**. Consequently, means are afforded for preventing cutting engagement between the cutting wheels **56** and **57** and the upper thread at all intermediate positons along the side of the book. In other words, cutting is to be effected only when the books have reached the position shown in FIGURE 2.

Such means comprise a spacer wheel **77** rotatably mounted on the shaft **58** at a central location between the cutting wheels **56** and **57**. The spacer wheel **77**, in other words, is capable of freely rotating relative to the rotating shaft **58** itself, while being restrained, however, to a selected axial location between the cutters **56** and **57**, as by a suitable adjustable spacer member **78**.

The diameter of the spacer wheel **77** slightly exceeds the diameters of the cutting wheels **56** and **57**. Consequently, as the rocker plate **67** is periodically moved downwardly toward a book in all positions of the book except that shown in FIGURE 2, the spacer wheel **77** abuts the top side surface of the book before the cutters can engage and sever the thread.

However, when downward rocking of the cutting mechanism occurs with the books in the position shown in FIGURE 2, the periphery of the spacer wheel descends far enough into the gap to allow cutting engagement between the cutting wheels **56** and **57** and the thread at the points **46** and **47**. It will be noted that as the spacer wheel **77** descends into the gap **52**, the spacer wheel biases the thread **12** slightly downwardly, thus tautening the thread and rendering the operation of the cutting wheels **56** and **57** even more effective.

While the trimming station **50** can be located at a position distant from the automatic sewing equipment, it has been found desirable to place it adjacent the sewer so that the elongated table support **17** and the conveyor **18** carries continuously from the sewing machine to the thread trimming device of the invention.

Thus, as appears most clearly in FIGURE 3, the stationary table **17** serves to support the outer portion of the books, and carries an outer book guide **81**, whereas book movement is afforded by the central conveyor **18** and upstanding lug **19**. The conveyor is moved by an appropriate structure, such as a sprocket wheel, not shown, engageable with lugs **82** mounted on the conveyor **18**, which is conveniently articulated to afford an endless structure.

One side of the conveyor is supported by a track member **83**; the other side, by a track member **84** secured to a narrow stationary strip **86**. An inner guide **87** on the framework plate **73** serves, in conjunction with the outer guide **81**, to align the books accurately.

As has been previously set forth, the thread cutting mechanism operates in a carefully timed sequence related to the cyclical operation of the sewing equipment, the cutters descending toward the subjacent conveyor each time the conveyor temporarily halts. The close physical positioning of the trimming device with respect to the sewing machine affords a further advantage in that a power take-off from the sewing machine can be utilized for timing purposes.

Thus, a shaft **91** (see FIGURE 3) can be connected to the sewing equipment so as to rotate at a velocity corresponding to the operational speed of the sewing machine.

A cam **92**, including a dwell track **93** and a lobe **94**, is mounted on the shaft **91** and actuates a roller-type cam follower **96**, causing the associated lever **97** to oscillate between the attitudes indicated in FIGURE 3. A tension spring **101** is secured at its lower end to an eye-bolt **102** mounted on the framework **74**, and is attached at its upper end to a threaded, tension-adjusting member **103** affixed to a Z-shaped bar **104** mounted on the lever **97** and biasing the adjacent end of the lever and cam roller downwardly into engagement with the cam.

A fulcrum pin **106** on a vertical framework member **107** rockably supports the oscillating lever **97**, and the nether end of the lever **97** is mounted on a pin **108** pivotally connected to a hub **109** on a threaded sleeve **110**. Threadably connected to the sleeve **110** is an operating rod **111**, or connecting rod, threadably connected in turn to the threaded sleeve **112** of a yoke member **113**. The threads on the opposite ends of the threaded stem **111** are oppositely inclined, thus providing for ready adjustment of effective rod length, similar to the arrangement in a turnbuckle.

The oscillatory motion of the timed cam **92** is transmitted from the operating rod **111** and through the yoke **113** to a pin **121** loosely journaled in the yoke **113** and secured to the bottom of the rocker plate **67**. The pin **121** is vertically slidable, within limits, within the vertical track formed by the spaced, bifurcated, yoke arms **123**. A compression spring **126** aligned by a keeper **127** depending from a closure cross bar **128** bears down on the pin **121**, tending to urge the pin **121** and the rocker plate **67** into lowermost position. The spring **126**, however, is sufficiently resilient so that as the yoke periodically descends, carrying the rocker plate **67** with it, the spring **126** absorbs the slight shock as the cutting mechanism encounters the book.

As will be appreciated, the connecting rod **111** will previously have had its length adjusted so that its downward stroke will slightly exceed the extent of downward movement of the cutting mechanism. Provision is made, in other words, for a lost motion connection between the pin **121** and the bottom of the yoke track so that at

the bottom of each stroke the pin lifts slightly from its seat; and this lifting movement is resiliently opposed by the spring **126** to absorb shock.

At the conclusion of the upper thread trimming operation, a pair of short stub thread ends **131** and **132** remain (see FIGURE 2) on the books **51** and **133**, respectively. The stub ends are spaced inwardly from the respective ends **134** and **136** of the books and are readily capable of being glued or otherwise flattened out in the subsequent steps of manufacture.

Still remaining to be dealt with, however, are lower loops **143** and **144** (see FIGURE 2), as well as the loop **44** shown in FIGURE 1.

Usually, the thread loop is sufficiently rigid so that it retains a substantially horizontal attitude.

In order to deflect the loop **144** into trimming engagement with the teeth **146** of an electrically operated shearing device **147** below the table we provide an upper nozzle **151** and an associated valve **152** connected to a suitable compressed air source, not shown. The air flow, or air jet **153** is directed substantially vertically downwardly and impinges with sufficient force on the horizontal thread loop **144** so as to deflect the loop downwardly into the path of the teeth **146**, cutting engagement ordinarily taking place as the book **133** advances, carrying the deflected loop **144** with it, into the teeth **146**.

In order to prevent the deflected loop from prematurely returning to a substantially horizontal attitude under its own resiliency, a second, or lower nozzle **161** and valve **162** structure is preferably afforded. The air jet **163** from this member is directed at a slight upward angle, as shown in FIGURE 2, so as to impinge on the upper surface of the deflected loop and thus retain it in shearing position. Being in close proximity to the loop as cutting occurs, the jet **163** is also effective to blow the cut loop portion away from the area and thus prevents clogging of the shears and undesirable accumulations of severed loops.

Conveniently, the shears **147** located at the loop trimming station **166** are adjustably mounted in a bracket **167** secured to the framework, thus enabling the machine set-up operator to locate the shearing blades **146** in a substantially horizontal attitude in close proximity to the loop to be trimmed.

While the shears can be of any suitable variety, it has been found that motor driven shears of the kind used to shear wool, for example, provide very satisfactory results.

Customarily, the shears operate continuously while the trimming machine is working. However, it is possible, by providing suitably timed switches, not shown, in the electrical conductors **173**, to turn the shears on and off in synchronism with the conveyor movement and hook placement.

Comparable remarks apply to the nozzle and valve assemblies. In other words, by suitable conventional mechanism, not shown, the valves can be synchronized with the other components of the device so that the air jets are directed against the loop only for the short intermittent periods when the loop reaches the proper trimming position.

Upon leaving the loop trimming station **166**, the two loop thread remnants are approximately as short as the previously severed thread stub **132**, for example, and are therefore as readily susceptible as the stubs to subsequent manufacturing operations. Objectionable thread tails are, in sum, reliably and automatically eliminated.

What is claimed is:

1. A thread trimming device for cutting a connecting upper thread and a lower thread loop formed by automatic book sewing equipment utilized in sewing the side of a book, said device comprising:

(a) a framework;

(b) a book conveyor mounted on said framework, said conveyor being operatively connected to the book sewing equipment and being in conjunction therewith in intermittent steps along a path crossing said framework, said conveyor including flight members positioning the books to afford gaps between adjacent ones thereof;

(c) an upper thread cutting mechanism on said framework movable in timed sequence with said conveyor between a first position removed from a subjacent book and a second position in engagement therewith;

(d) a thread cutting member on said mechanism;

(e) timing means connected to said thread cutting mechanism for moving said mechanism between said first and second positions in dependence upon the intermittent movement of said conveyor, said mechanism completing a cycle of movement from said first position to said second position and back to said first position each time said conveyor halts; and,

(f) spacer means on said upper thread cutting mechanism for spacing said cutting member from the upper thread as said spacer means encounters a book in said second position of said thread cutting mechanism, said spacer means being ineffective to space said cutting member from the upper thread when said spacer means is in registry with one of said gaps between adjacent books and said cutting mechanism is moved into said second position.

2. A thread trimming device as in claim **1** wherein said upper thread cutting mechanism further includes a rocker plate pivotally mounted on said framework, and a motor on said plate for driving said thread cutting member; and wherein said timing means includes a lever structure operatively connected to the book sewing equipment and to said rocker plate for cyclically moving said plate in dependence upon the movement of said equipment.

3. A thread trimming device as in claim **2** including a shaft journaled on said rocker plate and driven by said motor; and wherein said cutting member includes a spaced pair of cutting wheels selectively mounted on said shaft to effect severance of said upper thread at a predetermined location.

4. A thread trimming device as in claim **1** further including a lower thread loop severing mechanism mounted on said framework adjacent the path followed by the lower thread loop on a book on said conveyor.

5. A thread trimming device as in claim **4** wherein said lower thread loop severing mechanism is a powered shearing device having teeth arranged to face toward a lower thread loop moving along said loop path.

6. A thread trimming device as in claim **4** wherein said lower thread loop severing mechanism further includes pneumatic means for positioning said lower thread loop for engagement with said shearing teeth, and pneumatic means for removing the severed thread loop from the vicinity of said shearing device.

7. A thread trimming device as in claim **3** wherein said lever structure includes a lost motion connection with said rocker plate, and an interposed resilient member adjacent said connection to absorb any minor shock resulting from the engagement between said thread cutting mechanism and the book as said thread cutting mechanism moves from said first position to said second position.

8. A thread trimming device as in claim **1** wherein said spacer means includes a book engaging member located at a height below that of the lowermost portion of said thread cutting member, thereby limiting the extent of downward movement of said thread cutting member as said book engaging member abuts a subjacent book, the width of said book engaging member being less than the width of said gaps between said books, said book engaging member being rendered ineffective to space said thread cutting member away from said upper thread as said upper thread cutting mechanism moves from said

first position to said second position with said book engaging member located in registry with one of said gaps.

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U.S. Cl X.R.

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