Dec. 17, 1968 H. L. FENIMORE 3,416,715

STITCHING MACHINES FOR BINDING BOOKLETS

Filed Aug. 25, 1966 2 Sheets-Sheet 1

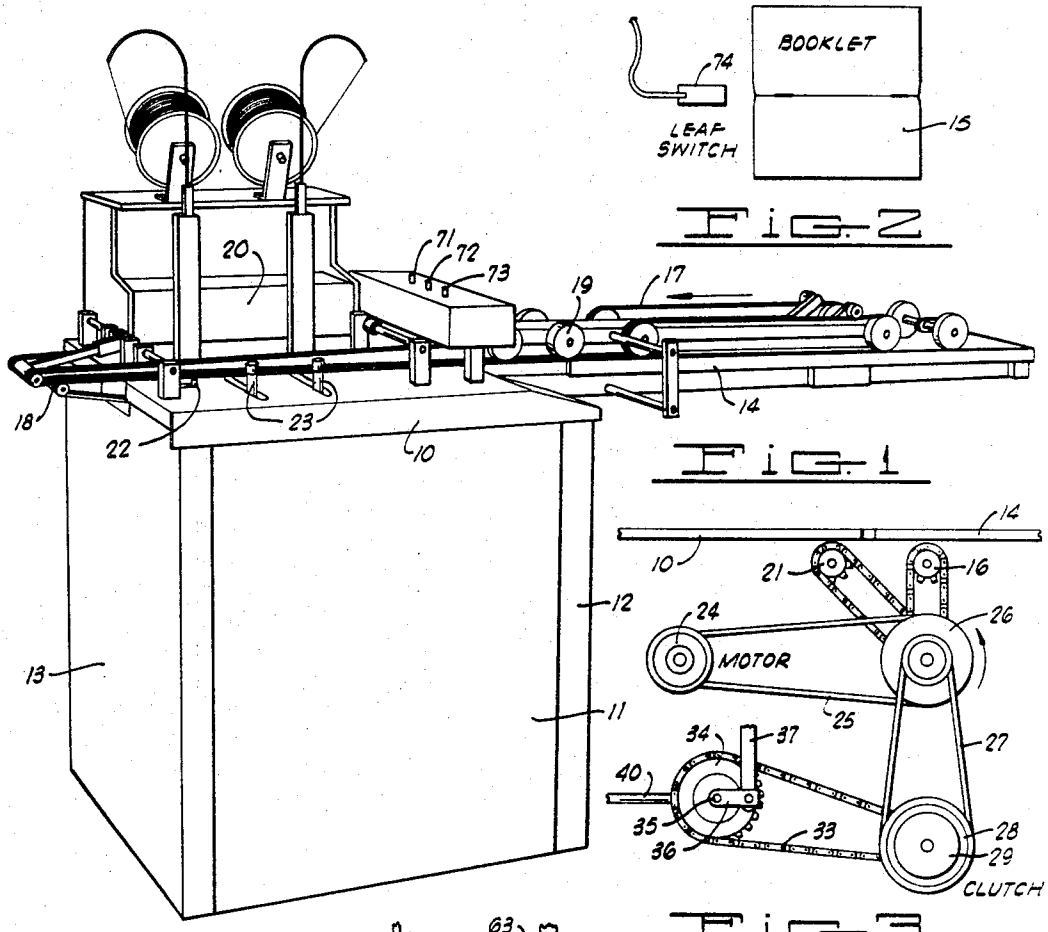


Fig. 1

Fig. 2

Fig. 3

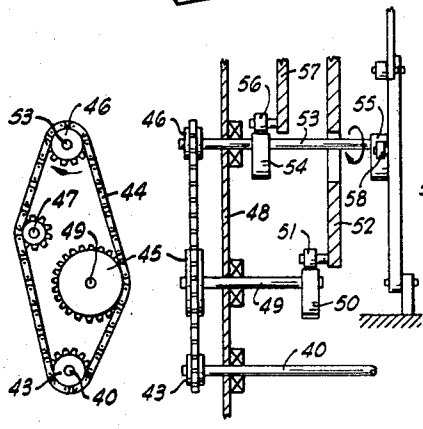


Fig. 5

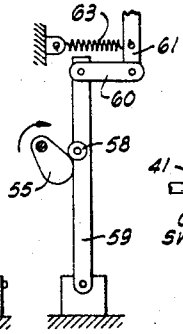


Fig. 6

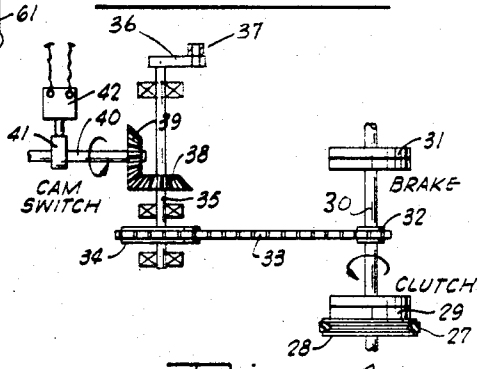


Fig. 4

Fig. 7

INVENTOR.
HARRY L. FENIMORE

BY Earl Babcock

ATTORNEY

Dec. 17, 1968 H. L. FENIMORE 3,416,715

STITCHING MACHINES FOR BINDING BOOKLETS

Filed Aug. 25, 1966 2 Sheets-Sheet 2

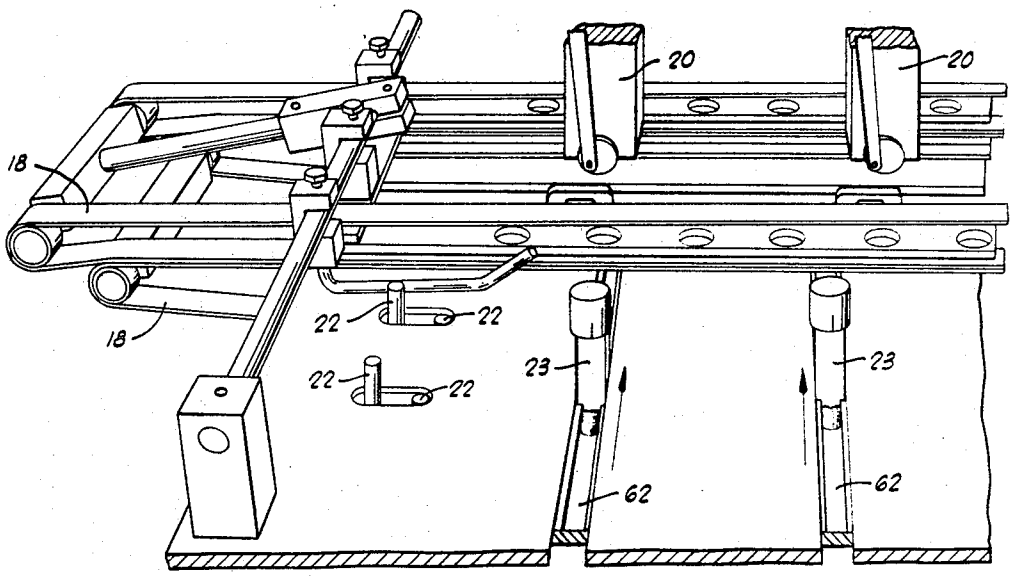


Fig. 8

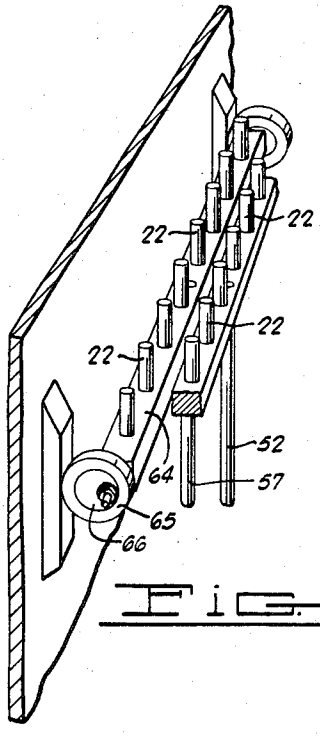


Fig. 9

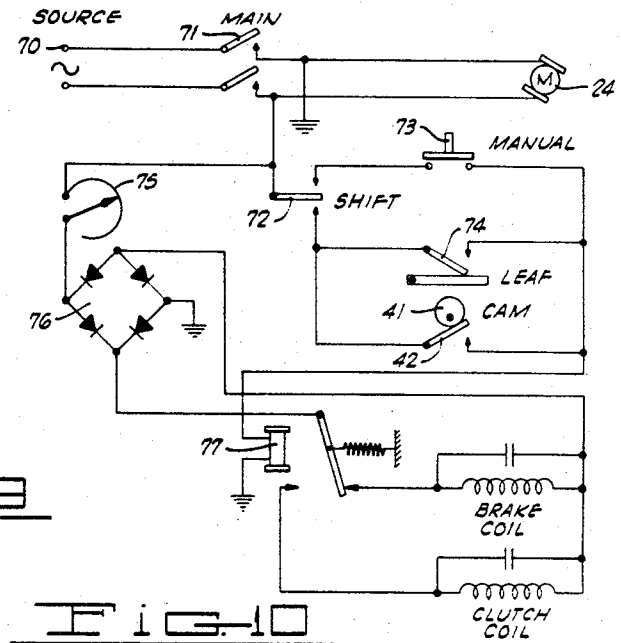


Fig. 10

INVENTOR.
HARRY L. FENIMORE

BY Earl Babcock

ATTORNEY

United States Patent Office 3,416,715
Patented Dec. 17, 1968

3,416,715

STITCHING MACHINES FOR BINDING BOOKLETS

Harry L. Fenimore, % Fenimore Mfg. Inc., Box 509, Woodward, Okla. 73801

Filed Aug. 25, 1966, Ser. No. 575,178
1 Claim. (Cl. 227—44)

ABSTRACT OF THE DISCLOSURE

This invention relates to the binding of booklets by what is known as stitching machines. The booklets to be stitched are fed across a table on belts. They are brought to a halt, temporarily, while automatically positioned correctly, both longitudinally and transversely, of their movement, and are stitched while so halted. To do this, there is a side jogger acting intermittently in unison with the driving means for the belts. The booklets are held in position longitudinally while temporarily halted by pins projecting up through the table. The pins are mounted on a bar extending transversely under the table. A cam, with its follower, is used to lift the pins into position at the proper time in the cycle of operation of the machine. There is an adjustment for varying the angular position of the bar with respect to the longitudinal dimension of the table.

This invention relates to stitching machines for use in the book-binding art, and more particularly to an arrangement for automatically feeding and positioning booklets in a machine so that they can be stitched by standard stitching equipment.

It is an object of the invention to provide continuously moving tapes for conveying bookets through a machine and at the same time bring each booklet to a stop, temporarily, with detaining means, while it is still on the tape, and properly position it, both lengthwise and transversely of the machine under a stitching head, stitch it, and then release the detaining means so that the tapes can convey it on out of the machine.

An additional object is to provide alternate detaining stops for controlling the position of the booklets while they are being stitched with wire, so as to stagger the stitches.

Other objects and advantages of the invention will become apparent upon consideration of the following description, taken in connection with the accompanying drawing, in which:

FIG. 1 is a perspective view of a machine incorporating the principles of the invention;

FIG. 2 is a diagrammatic view of a booklet and a leaf switch illustrating how the booklet may actuate the switch and indicating where the booklet is to be stitched;

FIG. 3 is a diagrammatic side view of an electric motor and driving mechanism which is mounted under the table of the machine of FIG. 1;

FIG. 4 is a diagrammatic plan view of the intermittent drive mechanism used in the assembly of FIG. 3;

FIG. 5 is a diagrammatic showing of the chain drive mechanism for controlling the longitudinal stops of the machine of FIG. 1, this mechanism being located under the rear panel of the machine of FIG. 1;

FIG. 6 is a diagrammatic illustration of the mechanism for actuating both the longitudinal stops and the side joggers of the machine of FIG. 1;

FIG. 7 is a diagrammatic side view (as viewed from the left) of the mechanism for driving the side joggers of FIG. 6;

FIG. 8 is an enlarged perspective view of the table top of the machine of FIG. 1 and better showing the tapes for conveying the booklets and the longitudinal stops and side joggers;

FIG. 9 is a diagrammatic perspective view of the longitudinal stops and the means for changing their angular position with respect to the longitudinal dimension of the machine of FIGS. 1 and 8; and

FIG. 10 is a circuit diagram of the machine of FIG. 1.

Referring to the drawing in detail, it will be seen that the machine of the present invention consists of a table **10** having the space beneath it enclosed by side panels **11**, a front panel **12** and a rear panel **13**.

There is an extension **14** on the front of the table for feeding booklets, such as **15** (FIG. 2) onto the table **10**, the flow being from right to left.

The extension **14** has four tapes **17** mounted on rollers, there being two upper tapes and two lower cooperating tapes. The left hand roller for the lower tape is driven in a counterclockwise direction by the sprocket wheel **16** (FIG. 3) as will be described hereinafter. Friction between the upper and lower tapes, or between the tapes and a booklet, when it is fed between them, causes the booklets to be fed onto the table **10**.

Similarly, the top of the table **10** has four tapes **18** mounted on rollers, there being two upper and two lower tapes. These feed the booklets on through the machine, and, together with the tapes **17** may be said to constitute the longitudinal dimension of the machine and determine the direction of flow of the booklets through the machine.

The two lower tapes **18** are driven by a sprocket wheel **21** (FIG. 3).

Idler rollers **19** are located on the table **10** between the tapes **17** and **18**.

As shown in FIG. 1, stitching heads **20** are mounted on the table **10** above and in between the two pairs of tapes **18**. These heads may be standard, and, per se, form no part of the present invention. Therefore, they are not shown or described in detail. It will be understood, however, that these heads operate to stitch, i.e., place wire staples in the bookets to hold the pages thereof together when the heads are lowered onto the booklets.

In accordance with the present invention, the tapes **17** and **18** are operated continuously, so that the booklets **15** always have a force exerted upon them tending to move them to the left, as viewed in FIG. 1 and FIG. 8 as they are fed through the machine between the upper and lower tapes.

The booklets are brought to a stop for the stitching operation, however, and they are automatically located properly with respect to the heads **20** for this operation. The friction between the tapes and the booklets is such that it can be overcome to permit the booklets to be held stationary temporarily while the stitching is accomplished. It is to the stopping and starting and proper automatic location of the bookets, while the tapes continue to move, that this invention is particularly directed.

The travel of the booklets along the longitudinal dimension of the machine is controlled by what is referred to herein as longitudinal stop pins **22** which are caused to project vertically above the table **10** temporarily.

It is within the purview of this invention to have only one set of stop pins **22**. However, it is preferred to provide two sets, to function alternately, being located at different places along the longitudinal dimension of the machine, so this is what is shown and described. The two sets are illustrated particularly in FIG. 9, and are brought into position by mechanism described hereinafter.

There are also side positioning pins, referred to herein as side joggers **23**. These move the booklets transversely of the longitudinal dimension of the table **10** and the travel of the tapes **17** and **18** and the booklets **15**.

The stopping, positioning and stitching steps must be in unison and intermittent. Thus, the machine must go through repeated cycles of operation. The mechanism for doing so will now be described.

As the diagram of FIG. 3 shows, the machine includes an electric motor **24**. By means of a V-belt **25**, the motor drives a pulley **26**. In turn, the pulley **26** drives sprocket wheels **21** and **16**, mentioned above, which drives the sets of tapes **17** and **18**.

The pulley **26** is connected by another V-belt **27** to a pulley **28** on a clutch **29**. The clutch **29** is mounted on the same shaft **30** as a brake **31** and a small sprocket wheel **32**.

The clutch **29** and brake **31** are operated by standard electromagnets. They operate alternately. When the clutch is engaged, the brake is released and vice versa.

The sprocket wheel **32** is connected by chain **33** to a larger sprocket wheel **34** on a shaft **35**. This affords some speeded reduction.

The shaft **35** has a crank **36** thereon driving a connecting rod **37** which moves the stitching head **20** down and then up.

Because the shaft **30** is operated only intermittently, only during the time that the clutch **29** is engaged, it will be understood that sprocket wheel **34** can be caused to make one complete rotation, and then come to a stop, so as to cause the head **20** to perform its stitching operation on one booklet, if the circuits to the electromagnets in the clutch and brake are controlled in response to a single rotation of the sprocket wheel **34**.

To accomplish this, the shaft **35** has a bevel gear **38**, as shown in FIG. 4. This drives a bevel gear **39** on a shaft **40**. Shaft **40** has a cam **41** thereon which operates a holding switch **42**, described hereinafter. As long as the switch **42** is closed, the electromagnet for the clutch **29** is energized and the sprocket wheel **34** is rotated.

The shaft **40** also is used to drive the mechanism which causes the longitudinal stops **22** and the side joggers **23** to function intermittently and in unison with the cyclic operation of the head **20**.

The shaft **40** extends along the lower portion of the enclosure under table **10**, and drives the mechanism shown in FIGS. 5, 6 and 7.

As shown in FIG. 5, there is a sprocket **43** which is driven by shaft **40** and which drives a chain **44**. Meshing with the chain **44** are three sprockets designated **45**, **46** and **47**. There are exactly the same number of teeth on sprocket **46** as there are on drive sprocket **43**. There are exactly twice as many teeth on sprocket **45** as there are on drive sprocket **43**. Hence, sprocket **46** rotates at the same speed as sprocket **43** and makes one complete rotation every time sprocket **34** makes one complete rotation.

Sprocket **45**, on the other hand, rotates at one-half the speed of sprocket **43** and makes one complete rotation only upon two complete rotations of sprocket wheel **34**.

Sprocket **47** is only an idler for the chain.

The drive mechanism of FIG. 5 may be located just inside the rear panel **13** under the table **10** and on the outside of an inner wall **48** (see FIG. 6) of the assembly, which is used to support the drive mechanism for the stops **22** and joggers **23**.

The sprocket **45** is on a shaft **49**, the inside portion of which carries a cam **50**. A follower **51** rides on this cam and raises a push rod **52** which actuates one set of longitudinal stops **22** (the forward set) as shown in FIG. 9.

The sprocket **46** is on a shaft **53**, the inside portion of which carries two cams designated **54** and **55**.

A follower **56** for cam **54** raises a push rod **57** which actuates the other set of longitudinal stops **22** (the rear set).

The cam **55** has a follower **58** which actuates the side joggers **23** through suitable linkage mechanism.

The cam **55** is carefully designed to cause the side joggers to advance rapidly toward the tapes **18** during the initial part of their travel in positioning a booklet under the head **20**, and then advance very slowly toward the tapes during the final part of their travel. The friction between the tapes and the booklets must, necessarily, not be great, and if the joggers exert too great a side thrust on the booklets, they will be moved clear out of the proper position laterally.

The linkage mechanism for actuating the side joggers **23** in response to movement of the cam **55** includes a lever **59** which is pivoted on the frame of the machine at its lower end. This lever carries the follower **58**.

There is a horizontal link **60** connecting the upper end of lever **59** to a vertical link **61**. The link **61** is connected to a plate (visible through the slots in the table **10** in FIG. 8) which is designated **62**. This plate has the side joggers **23** fixed thereto.

There is also a spring **63** connected to a vertical link which holds the follower **58** against the cam **55** and urges the plate **62** and the joggers **23** toward the tapes **18** at all times.

Referring to FIG. 9, it will be seen that the stops **22** are carried by bars **64** which extend transversely of the machine. There are rollers **65** at the outer ends of each of these bars (only one bar being so illustrated for clarity), and these rollers are mounted as eccentrics **66**.

By adjusting the eccentrics, the angle between the axis of the bars **64** and the longitudinal dimension of the tapes **18** can be changed, the bars **64** pivoting about their center point. The center points of the bars remain fixed, however, by the push rods **52** and **57**. The bars **64** are not individually adjustable lengthwise of the machine. Only the angle is adjusted by moving one end of the bar out and the other in my manipulation of the eccentrics.

The electrical system of the machine is shown in FIG. 10. There is a source **70** and a main switch **71** for making connection to the motor **24**. A connection is made to a shift switch **72** so that the intermittent portion of the mechanism may be operated manually by switch **73**, but ordinarily the operation is under the control of the automatic switch **74**.

The leaf switch **74** is located in the machine just in advance of the tapes **18** so as to be operated by the booklets **15** as they are fed through the machine. When a booklet strikes the leaf switch, it energizes the electromagnet of the clutch and starts the cyclic operation of sprocket **34**. Switch **74** remains closed long enough to permit cam **41** to close switch **42** and hold clutch **29** in engagement until the cam **41** releases switch **42**.

The connections to the electromagnets of clutch **29** and brake **31** are illustrated in FIG. 10, these magnets operating under direct current through a variable resistance **75** and a rectifier **76** under the control of a relay **77**.

The operation of the machine will be apparent from what has been described above. When the booklet closes switch **74**, the brake **31** will release shaft **30** and clutch **29** will start the intermittent operation of the holding and stitching mechanism. The rear stops **22** will rise every cycle of the intermittent mechanism and the forward stops **22** every other cycle of the stitching. Thus the stitches will be staggered at two different places in the booklets. Then as the stops **22** are withdrawn to a point beneath the tapes **18**, the booklets will be carried on out at the rear of the machine. With each cycle, a booklet is laterally positioned correctly by the side joggers.

While only one embodiment of the invention has been shown and described herein, it is obvious that various changes may be made in the arrangement and construction of parts without departing from the spirit of the invention or the scope of the annexed claims.

I claim:

1. In a stitching machine for binding booklets, in com-

bination, a table, tapes for moving booklets longitudinally along the table, means for continuously driving said tapes while the machine is in operation, longitudinal stops adapted to project through said table to temporarily stop each booklet as it is conveyed longitudinally by said tapes, said longitudinal stops consisting of pins secured to a bar extending transversely across the table together with an eccentric means for varying the angle of the bar with respect to the longitudinal dimension of the table, a stitching head, driving means for intermittently operating said stitching head for stitching each booklet as it is temporarily stopped by said stops, and driving means for lifting said longitudinal stops, including a cam and follower.

References Cited

UNITED STATES PATENTS

3,248,033	4/1966	Francis et al.	227—100
1,276,528	8/1918	Hopping	227—3
2,567,735	9/1951	Scott	74—569
3,055,009	9/1962	March	227—3

TRAVIS S. McGEHEE, *Primary Examiner.*

HORACE M. CULVER, *Assistant Examiner.*

U.S. Cl. X.R.

227—3.