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Anderson

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[54] **SEMI-AUTOMATIC BOOKBINDER**

[75] Inventor: **Clarence L. Anderson,** Penfield, N.Y.

[73] Assignee: **Magnamatrix Corporation,** Rochester, N.Y.

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[21] Appl. No.: **321,547**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 133,026, April 12, 1971, Pat. No. 3,757,736.

[52] **U.S. Cl.** ..... **118/5,** 118/236, 118/59, 118/238, 118/244, 11/1 AD

[51] **Int. Cl.** **B05c 1/02,** B42c 9/02

[58] **Field of Search** ..... 118/236, 238, 244, 59, 118/66, 5; 11/1 AD

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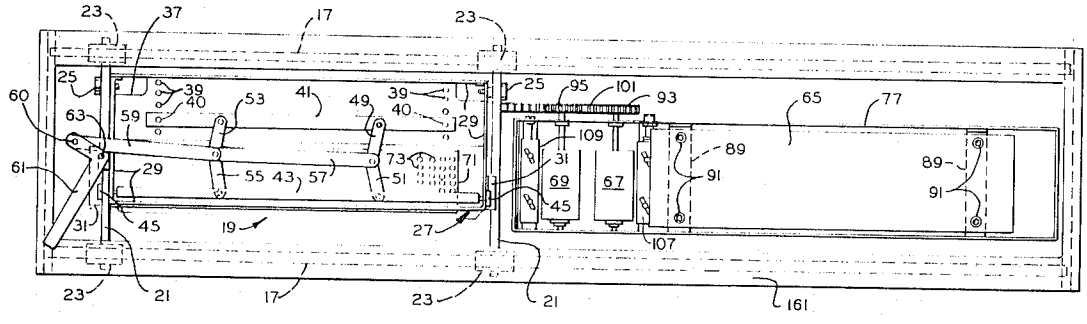
Primary Examiner—John P. McIntosh

Attorney, Agent, or Firm—Kenyon & Kenyon Reilly Carr & Chapin

[57] **ABSTRACT**

An improved semi-automatic bookbinder which permits binding books with full covers using a hot-melt adhesive is shown. Two glue drums are provided, one for applying glue and the other adjustable for removing excess glue when binding without a cover or for adding additional glue when binding with a cover. Also shown is an improved drive system for moving the pages over the applicator, an improved clamp for holding the pages and an electrical system which add flexibility and prevents operation when the glue is not at the proper temperature.

12 Claims, 7 Drawing Figures



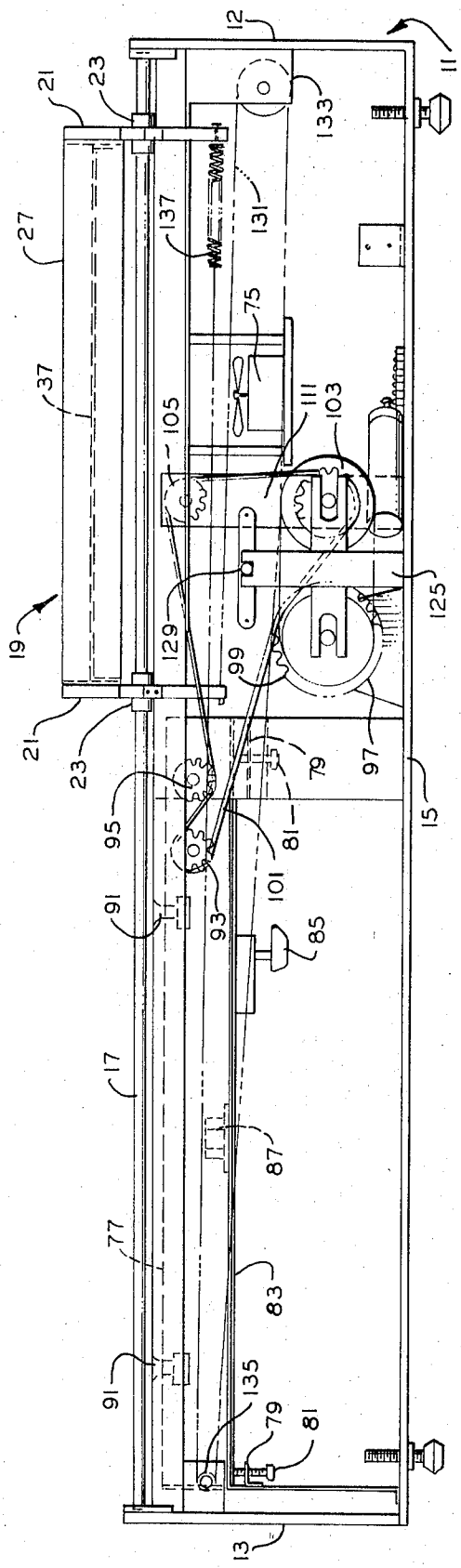


FIG. 1

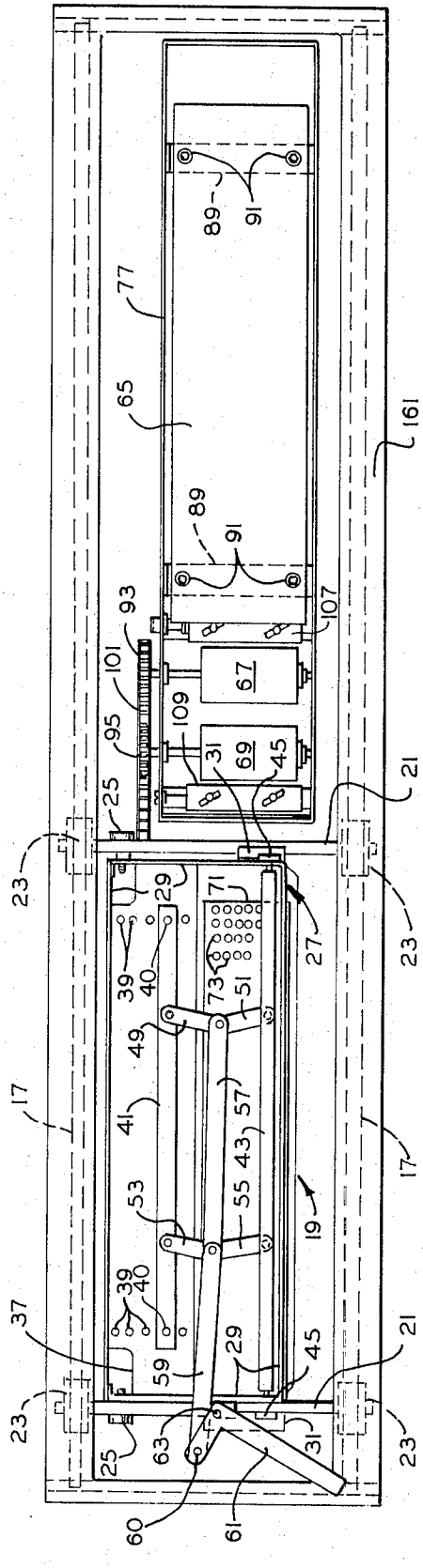


FIG. 2

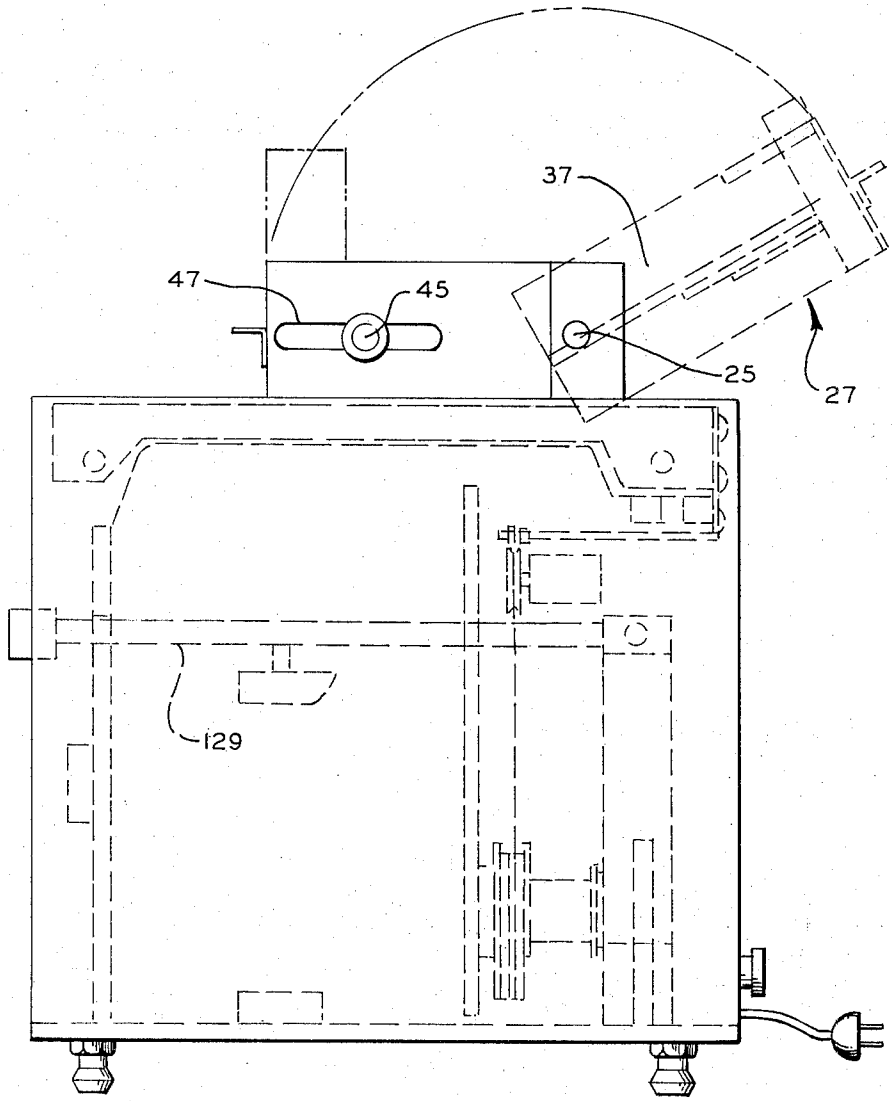


FIG. 3

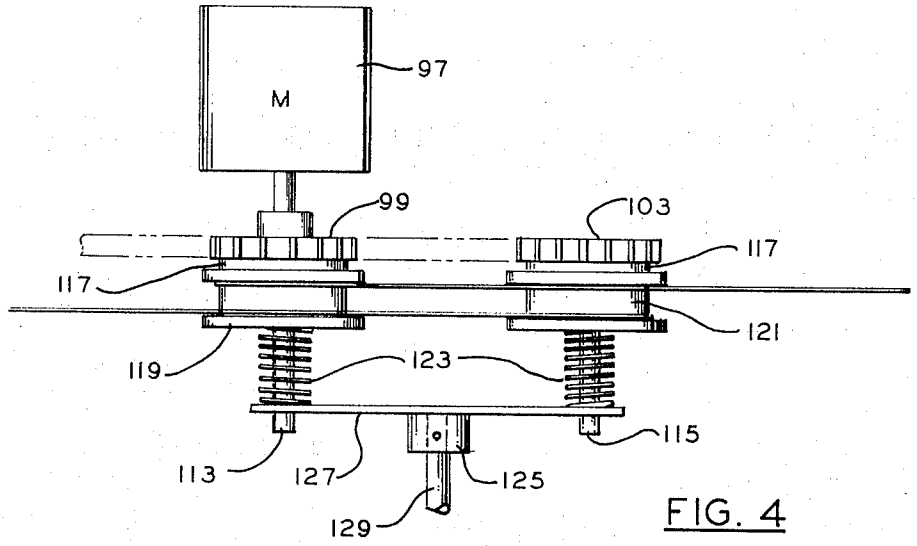


FIG. 4

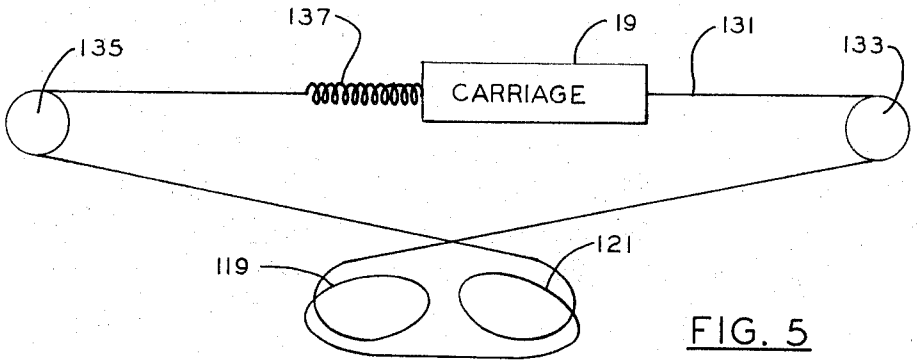


FIG. 5

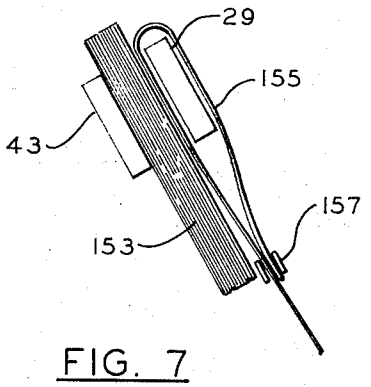


FIG. 7

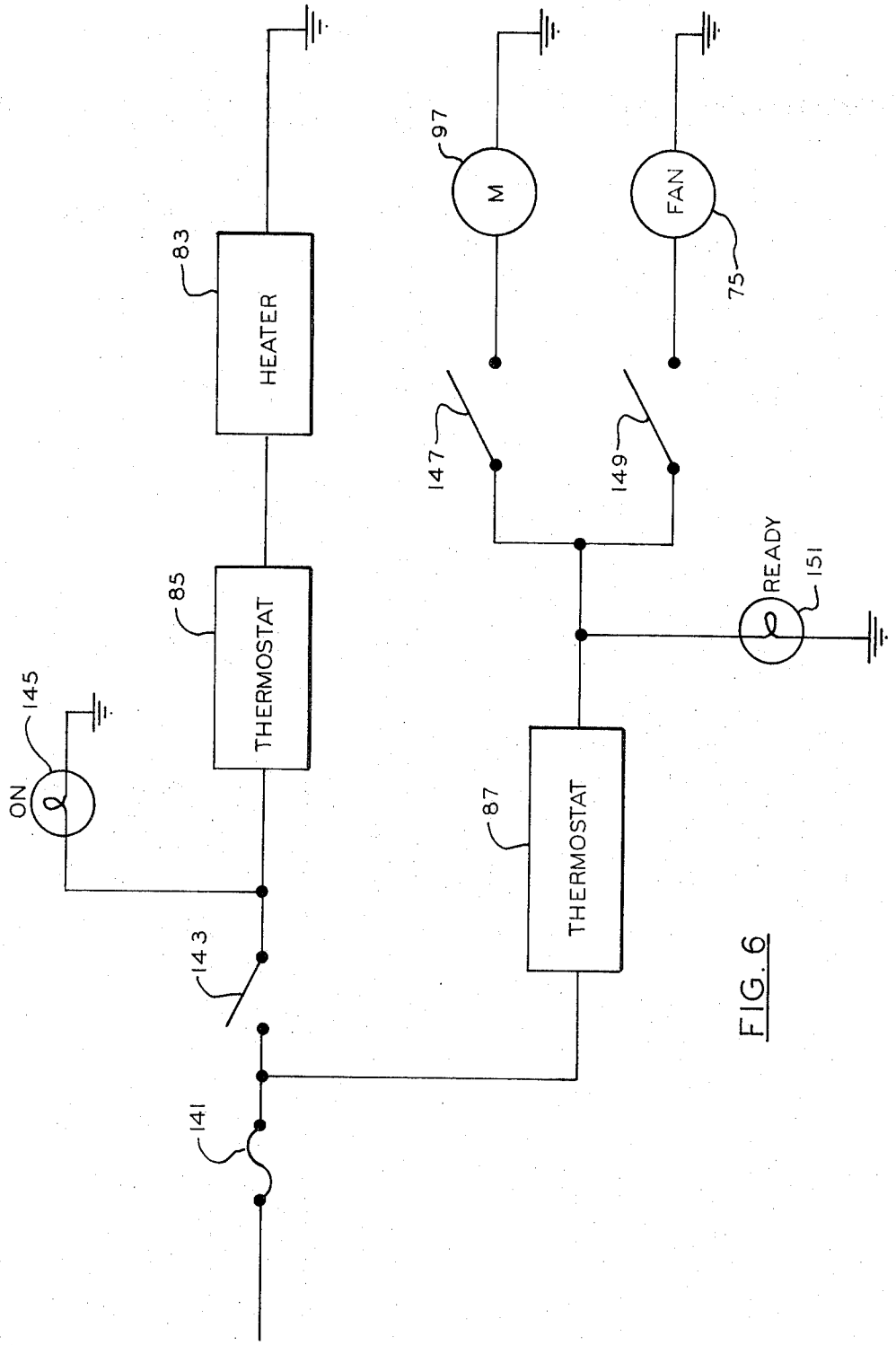

HEATER
83
THERMOSTAT
85
ON
145
143
141
THERMOSTAT
87
M
97
FAN
75
147
149
READY
151

FIG. 6

SEMI-AUTOMATIC BOOKBINDER

RELATED APPLICATIONS

This is a continuation-in-part of application Ser. No. 133,026 filed Apr. 12, 1971, now U.S. Pat. No. 3,757,736 the disclosure of which is hereby incorporated by reference.

BACKGROUND OF THE INVENTION

This invention relates to bookbinding in general and more particularly to an improved semi-automatic bookbinder.

The advantages of a semi-automatic low cost bookbinder for binding small quantities of books which provides as good a bind as those which are mass produced by complex and costly machinery over prior art methods such as stapling, spiral binders, punched hole binders, etc., are discussed in the above-referenced application. That application discloses a bookbinder which offers those advantages. The pages to be bound are clamped in a carriage which is then passed over a rotating drum having glue on it which is deposited on the pages to bind them together. Also shown is a means of aligning, preheating and cooling the pages and tape-dispensing apparatus to cover up the bound ends.

The apparatus disclosed performs quite well. However, through experience with it and the needs of the users, various deficiencies have been noted. It has been discovered that a single drum is difficult to control so as to place an even layer of glue on the end of the pages. It has also been found that better results are obtained if the ends to be bound are aligned rather than the opposite ends.

Potential users in most cases would rather cover the book with a single folded cover than tape the end as disclosed in the previously-mentioned application. In addition, the drive mechanism disclosed therein, although it performed quite well, was too costly.

Thus, a need for an improved bookbinder which overcomes these deficiencies is evident.

SUMMARY OF THE INVENTION

The present invention provides an improved bookbinder which solves these problems and thus provides improved operation meeting users needs at a lower cost.

As in the previously disclosed bookbinder, the pages are clamped in a carriage, are aligned, preheated, passed over a glue application means and then cooled. The pages are now aligned, however, on the preheat plate. As before the carriage is driven automatically from end to end. However, in the improved bookbinder, two wheels are used in glue application, one to apply glue and one to remove excess glue. An improved clamp permits binding in a full cover and the tape-dispensing means is no longer included. (A separate tape dispenser may be used if this type binding is desired). Also described is a method of making a covered book with the improved binder and a clamping mechanism. Since when operating in the covering mode it is not desired to cool the glue a switch to control the cooling fan is included. In addition, an improved and lower cost carriage drive means is disclosed.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an elevation view of the preferred embodiment of the bookbinder of the present invention with its covers removed;

FIG. 2 is a plan view of the same embodiment with a cover placed over it;

FIG. 3 is a side view of the same embodiment;

FIg. 4 is a plan view of the drive clutches of FIG. 1;

FIG. 5 is a schematic of the carriage drive system of FIG. 1;

FIG. 6 is an electrical schematic of the circuits used in the embodiment of FIG. 1;

FIG. 7 is a side view showing insertion of a cover in the clamp of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The operating portions of the bookbinding machine are supported by a frame **11** shown on FIG. 1 as comprising at least two end pieces **12** and **13** and a bottom piece **15.** Running the length of the frame **11** and secured to the top of end pieces **12** and **13** are two parallel slide rods **17** shown on FIGS. 1 and 2.

The carriage **19** in which the pages to be bound are supported rides on rods **17** for movement from one end to the other as will be explained below. The carriage **19** includes two cross members **21** supported by ball bushings **23** on rods **17.** Between the members **21** and secured to them by bolts **25** is a frame **27.** Frame **27** has four rectangular sides **29** made from a single folded sheet metal piece. Frame **27** is rotatable about bolts **25** as shown on FIG. **3.** When in the position shown on FIGS. **1** and **2** it is supported by lips **31.**

Secured inside frame **27** is a support plate **37.** This plate **37** contains two parallel rows of adjustment holes **39,** on ¼ inch centers, for example. These holes are used to adjust for book thickness as will be described below. Mounted between the holes by means of pins **40** is a support bar **41,** part of a four bar linkage. Parallel to bar **41** and mounted for sliding movement within frame **27** is a clamp plate **43.** Plate **43** is supported by rivets **45** for sliding movement in slots **47** cut in the ends of frame **27.**

Bar **41** and plate **43** are linked together by bars **49** and **51** and **53** and **55.** These bars are then linked by a bar **57.** Pins or rivets at each of the junctions permit rotation in conventional fashion. Attached to the junction of bars **53, 55** and **57** is a bar **59** attached by a pin **60** to a lever **61** which is mounted for rotation about a pin **63** fixed to frame **27.**

Rotation of lever **61** will move the bars of the linkage causing plate **43** to open and close on the side of the frame **27.** This allows about one-half inch of adjustment. To adjust for book thickness, bar **41** is moved to the proper set of holes **39** which may be on ¼ inch centers, for example.

The normal operating cycle is for carriage **19** to be moved against plastic spacers **64** placed over rods **17** at the end **12** of frame **11** over a preheat plate **65.** Lever **61** is operated to open clamp plate **43** and the pages to be bound are inserted between the clamp plate **43** and frame **27** and lever **61** then rotated to clamp the pages in place. Depending on book thickness, bar **41** will be adjusted by pulling up on pins **40** in slots **39** and positioning bar **41** prior to clamping. The carriage **19** is then moved across wheels or drums **67** and **69,** which

apply hot glue, to the position shown on FIGS. 1 and 2 where the pages will be over a plate 71 containing a plurality of holes 73 beneath which is mounted a fan 75 which blows air through the holes 73 and across back of the book for cooling the glue. Upon cooling, the bound pages are removed by releasing clamp plate 43 with lever 61.

Below plate 65 is the glue container 77. This is essentially a rectangular metal box supported by frame 11 via brackets 79 and set screws 81. On the bottom of the box 77 is mounted a heating pad 83, essentially comprising heating elements embedded in silicone rubber. Such units are available from Watlow Co. Provided with the heating pad is a thermostat 85 for temperature control. An additional thermostat 87 which may be a White-Rodgers Fixed Snap Disc. Fan PN 3 F01–350 is mounted inside box 77 and will be immersed in the glue contained therein.

Plate 65 is supported by two brackets 89, secured to the box 77, via adjusting screws 91. This permits adjusting plate height in relation to drums 67 and 69. Drums 67 and 69 are supported in bearings affixed to box 77 for rotation therein. They are driven in opposite directions respectively by sprockets 93 and 95. The source of drive power is a motor 97 which has mounted on its shaft a sprocket 99. A chain 101 is passed over sprocket 99, under another sprocket 103 to be described below; thence over an idler sprocket 105; thence to the bottom of sprocket 95; thence over the top of sprocket 93 and back to sprocket 99.

Associated with drums 67 and 69 are adjustable doctor blades 107 and 109, respectively. These are mounted in conventional fashion with slotted holes being provided for fine adjustment and fastening purposes.

As previously described, the pages are first clamped in carriage 19 over plate 65. Plate 65 which is heated to about 200 degrees along with the glue preheats the ends of the pages to help glue to flow freely. As will be described in connection with FIG. 5 below, the motor will not operate until thermostat 87 closes indicating the glue is properly melted. The pages are then moved over wheel 67 which is rotating in the same direction as carriage movement. Wheel 67 applies glue (or adhesive) to the ends of the pages. Glue thickness is controlled by adjusting doctor blade 107 and plate 65. Wheel 69 is a wiper wheel which removes excess adhesive and tends to push adhesive up between pages. It should preferably be about 0.040 inches above wheel 67. Doctor blade 109 is adjusted to wipe as much adhesive as possible off wheel 69 (clearance of 0.002–0.003 inches). When binding a book with a cover, wheel 69 may also be used to increase the amount of glue applied as will be described below.

Although the carriage may be moved manually from end to end, a drive system is provided to facilitate this process. Since the carriage must move back and forth from end to end, a two direction drive is provided. FIG. 4 illustrates this drive. Sprocket 99 provides a drive in one direction and sprocket 103 a drive in the other direction. Sprocket 99, as previously described, is attached to motor 97. Sprocket 103 is supported by bracket 111 attached to frame 11. Slipped over the motor shaft 113 and sprocket 103 and shaft 115 and free to rotate thereon are first a cork pads 117, then pulleys 119 and 121, respectively, and finally, springs 123. A vertical member 125 is mounted to frame 11 for pivotal motion. Member 125 has a slotted cross member 127 affixed to it which slips over the ends of the shafts in front of springs 123, holding these springs 123, pulleys 119 and 121 and cork pads 117 in place. (This is also shown on FIG. 1). A handle 129 is attached to the top of member 125 to rotate it.

In the neutral position, as shown, both springs 123 will be loose and neither pulley 119 nor pulley 121 will rotate. If handle 129 is pushed to the right, the spring 123 associated with pulley 121 will push pulley 121 against cork pads 117 and cause the rotation of sprocket 103 to be transmitted to it by friction. Similarly, movement of handle 129 to the left will cause pulley 119 to be engaged. Pulley 121 will move in one direction and pulley 119 in the opposite direction.

The manner in which the carriage is driven may be seen from FIGS. 1 and 5. A cable 131 is secured to the carriage 19. It is passed over an idler pulley 133; thence wrapped around pulley 119; thence wrapped around pulley 121 in the same direction; thence over an idler pulley 135 and then connected via a tensioning spring 137, to insure proper pressure of the wire on the pulleys, to the carriage 19.

Thus by pushing lever 129 one way or the other, one or the other of pulleys 119 or 121 will be caused to engage by the spring pressure thereon driving the carriage in one direction or the other. Motion in the one direction is for glue application and in the other for carriage return. Speed may be varied depending on how far the lever is pushed and hence how much slippage occurs. In the neutral position, the operator may also manually push the carriage without harming the drive mechanism.

With only a single applicator drum 67 these speed variations could cause unevenness. However, the addition of the wiper wheel 69 for removal of excess adhesive and flattening of adhesive assures that an even application will result for all carriage speeds.

FIG. 6 shows the electrical schematic of the bookbinder. Power is provided through fuse 141 to on-off switch 143. The output of this switch is provided to an indicator lamp 145 and heater thermostat 85 which is in series with heater 83. This will cause the heater 83 to begin to melt the glue. Power is also provided to thermostat 87 immersed in the glue. When operating temperature (about 350°) is reached, thermostat 87 will close supplying power to motor switch 147 and fan switch 128. It will also light the ready indicator 151, which is in parallel with switches 147 and 149, to show that the binder is ready for operation. Switch 147 may be closed and operation commenced. Thermostat 85 should be set at about 370° and will turn power to heater 83 on and off to maintain that temperature. Thermostat 87 is set preferably to switch on at 350° and off at 330°.

As mentioned previously, fan 75 is used to cool the glue and thus speed up operation. A separate fan switch is provided since there are times when the fan is not used, for example, when making a book with a cover, as will now be described.

As discussed above, one requirement for a bookbinder of this type is the capability to put covers on a book. The design of the present apparatus permits this to be done in a convenient fashion. When making a book with a cover, the frame and clamp assembly 27 is rotated to the position shown in dotted lines on FIG. 3. Refer now to FIG. 7, a cross section of assembly 27.

The pages 153 and the cover 155 are placed in the assembly 27 from the bottom and clamped in place between side 29 and clamp 43. The cover is folded over backwards around side 29 and clipped together by a larger paper clip or the like 157. The assembly 27 may then be rotated to its normal position, and the pages realigned against plate 65. The paper clip can also be installed at this location. After passing over drums 67 and 69, the assembly 27 is again rotated up and before the adhesive is completely dry the paper clip is removed and the cover is brought around over the back of the book to the proper position, the clamp is released, and the book is removed toward the operator. The book is then placed in a clamp such as that described in application Ser. No. 321,546 filed on even date herewith and compressed therein as the glue dries, resulting in a strong and attractive finished product. In this mode of operation doctor blade 109 of FIG. 2 may be adjusted to allow extra glue to be deposited to form a better bond between the cover and pages.

The ability to rotate assembly 27 is also useful in operations where no cover is applied. It allows the page alignment to be checked prior to applying adhesive. It permits checking the finished product before unclamping to see if another pass is needed. And it allows the pages to be held in a position where tape can be applied over the bound ends when desired. Tape is applied by cutting the tape to length, placing it on the spine of the book while in the clamp. It is then removed from the clamp and processed in the apparatus of my above-referenced co-pending application in the same manner as with covers.

Glue is replaced by dropping it in pot 77 to the right of plate 65. Glue need not be removed from the pot except to be replaced with a different kind of adhesive. Adhesive can be hot-melts, liquid adhesive or lower temperature melts than those previously mentioned. The heater is either turned off or thermostats can be set at lower temperatures.

For aesthetic and safety reasons a cover 161 shown on FIG. 2 which goes over frame 11 covering the front and back and a portion of the top is provided. (The switches and lamps shown on FIG. 6 may be mounted on this cover 161 or on a front panel which will be bolted to frame 15).

Thus an improved semi-automatic bookbinder which is less costly and more efficient and a method of making covered books with the bookbinder have been shown. Although a specific embodiment has been shown and described, it will be obvious to those skilled in the art that various modifications may be made without departing from the spirit of the invention which is intended to be limited solely by the appended claims.

What is claimed is:

1. In a bookbinder comprising at least a frame, a clamp for clamping pages to be bound, said clamp mounted in a carriage movable on rods from one end of the frame to the other, and glue application means to apply glue to ends of the pages when said carriage is moved from one end to the other, improved glue application means comprising:

a. a container filled with glue;

b. a first applicator drum mounted for rotation on an axis perpendicular to the direction of movement of the carriage, with the bottom of said drum immersed in the glue;

c. a second drum similarly mounted parallel to said first drum;

d. a doctor blade mounted parallel to the axis of said second drum adjustable to wipe excess glue from said second drum when moved close to the circumference thereof and to permit said second drum to apply extra glue to the pages when moved away from said second drum;

e. means rotating said first drum in a direction such that its tangential velocity is in the same direction as the motion of the pages to be bound when moving from said one to said other end and rotate said second drum in a direction opposite thereto said means comprising:

1. an electric motor having a first sprocket on its shaft;

2. a second sprocket mounted to said first drum;

3. a third sprocket mounted to said second drum;

4. an endless chain linking said first, second and third sprockets; and

f. means coupling said motor to said carriage to provide a bi-directional drive, said means comprising:

1. a drive shaft parallel to the shaft of said motor and supported for rotation about its axis;

2. a fourth sprocket affixed to said shaft and contacting said chain so as to rotate in a direction opposite to the motor shaft;

3. a first pulley supported for rotation;

4. a second pulley similarly supported;

5. a first clutch coupling, when operated, said first pulley to the motor shaft;

6. a second clutch coupling, when operated, said second pulley to said drive shaft;

7. means to selectively operate one of said first and second clutches;

8. a first idler pulley mounted at one end of the frame;

9. a second idler pulley mounted at the other end of the frame; and

10. a cable having a first end coupled to the side of said carriage closest said first idler, said cable being passed over said first idler to said first pulley then around said first pulley, thence around said second pulley, thence over said second idler and the second end of said cable coupled to the other side of said carriage.

2. The invention according to claim 1 wherein one of said first and second ends of said cable is coupled to said carriage through a spring.

3. The invention according to claim 1 wherein said first and second clutches comprise:

a. first and second discs of resilient material placed over the ends of the respective one of said motor and drive shafts having one side contacting the sprocket thereon; and wherein

b. said first and second pulleys are mounted so as to be free to rotate on said respective motor and drive shafts on the other side of said first and second discs; and

c. said means to selectively operate said first and second clutches comprises means to press one of said first and second pulleys against its respective first and second disc.

4. The invention according to claim 3 wherein said means to press comprise:

a. a bar slotted on each end to slip over said drive and motor shafts;

b. a first spring placed over said motor shaft between said bar and said first pulley and said bar;

c. a second spring placed over said drive shaft between said second pulley and said bar; and

d. means to move said bar so as to compress one of said first and second springs.

5. The invention according to claim **4** wherein said means to move comprise:

a. a vertical rod mounted for rotation and solidly affixed to the center of said bar; and

b. a lever solidly affixed to said rod to rotate said rod.

6. The invention according to claim **1** wherein the glue is a hot melt adhesive and said bookbinder further includes means at said one end of the frame to heat said adhesive and means at the other end including a fan to cool the adhesive which has been applied to the bound book and further including means to selectively enable or disable said fan whereby when binding books without full covers said fan may be enabled and when binding books without full covers said fan may be disabled.

7. The invention according to claim **6** wherein said glue must be used at a predetermined temperature and further including a first thermostatic switch placed to measure the temperature of said glue, said switch being in the electrical path to said motor and set to close the circuit to said motor only when it has sensed said predetermined temperature.

8. The invention according to claim **7** wherein the heating means comprise electrical heaters and further including a second thermostatic switch similarly mounted to measure glue temperature and placed in the circuit of said heaters, said second thermostatic switch adapted to close the circuit when the glue temperature is below a temperature slightly above said predetermined temperature and to open when said glue temperature reaches a predetermined level which exceeds said predetermined temperature by a greater amount.

9. The invention according to claim **6** wherein the glue container located at said one end is covered with a plate which will be heated thereby, whereby before being moved from said one end to said other said pages may be preheated by said plate.

10. The invention according to claim **9** wherein the clamp in said carriage is rotatable between a first angular position and a second angular position.

11. The invention according to claim **10** wherein said clamp comprises:

a. a rectangular member open on both sides and mounted to the carriage for rotation between said first and second angular positions;

b. a vertical clamping member slideably mounted between two sides of said rectangular member for movement to and from one of the other sides of said rectangular member; and

c. a four bar linkage for moving said vertical clamping member.

12. The invention according to claim **11** wherein one of the portions of said linkage is adjustable with respect to said rectangular member to provide adjustment for book thickness.

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