

[54] **BOOK BINDING**

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118/72, 241-243**

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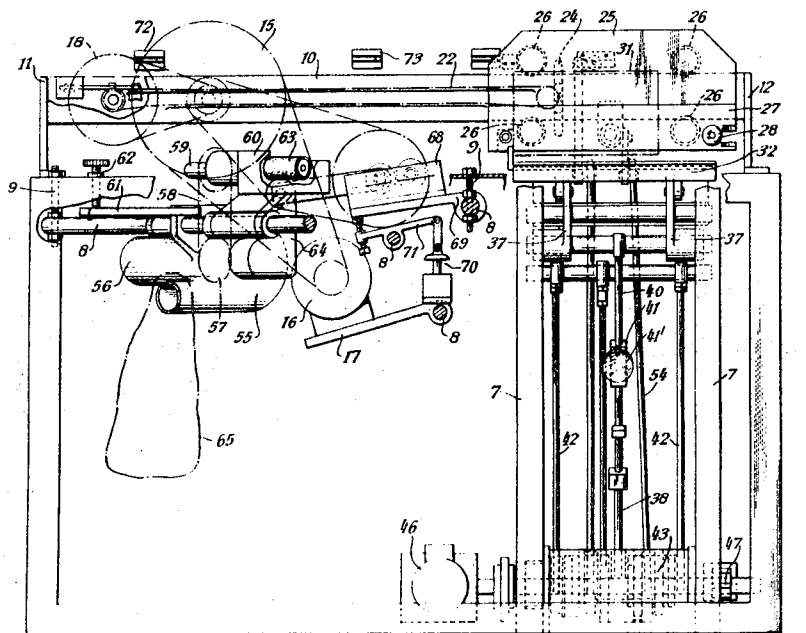
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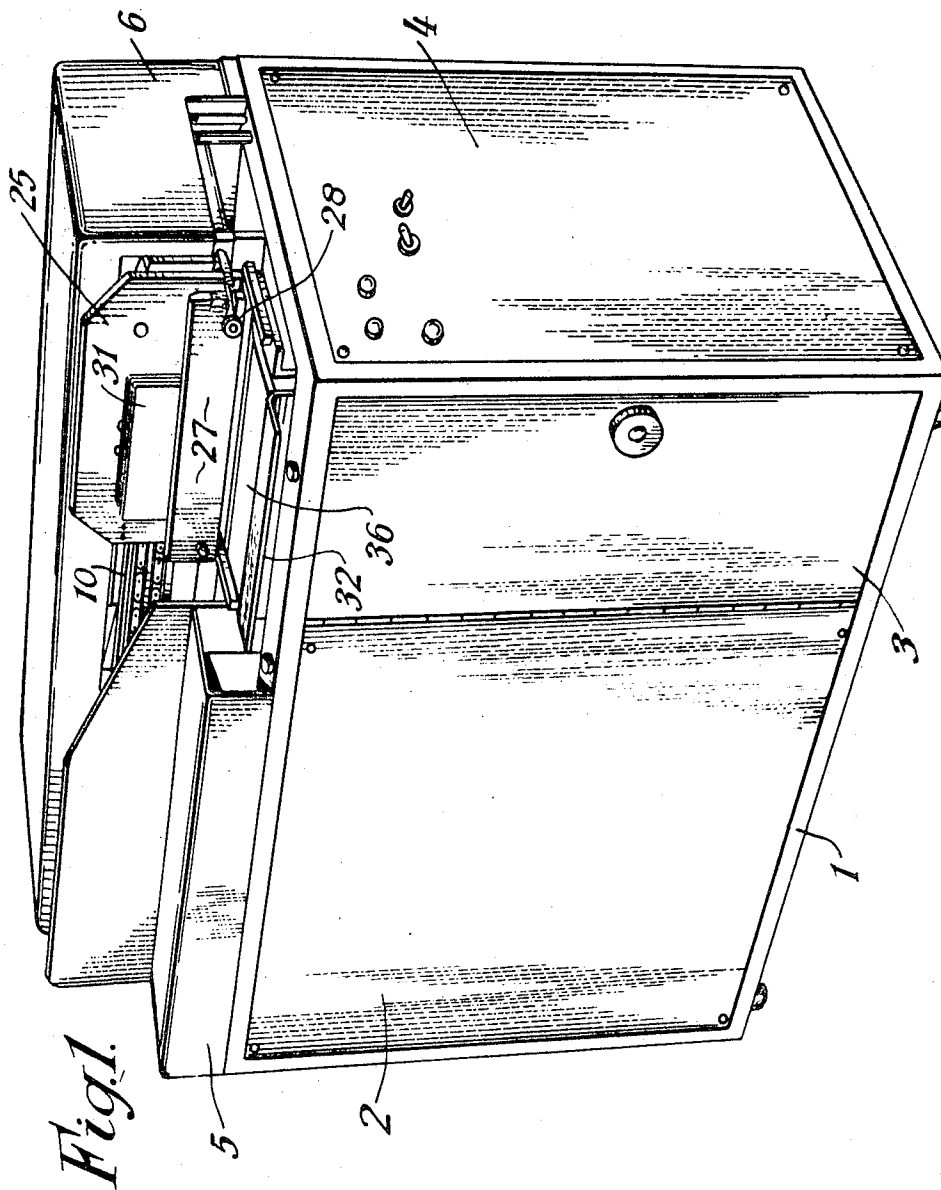
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[57] **ABSTRACT**

A bookbinding machine in accordance with the invention comprises a device for applying a cover to a book back, a device for preparing the back by cutting or abrading, and a device for applying adhesive to the prepared book back. These three devices are arranged in a straight line and are so disposed that a book commences its outwardly travel from the cover-applying device passes over the adhesive-applying device which is rendered inoperative. The book returns from the preparing device and over the operative adhesive-applying device. The cover is then applied.

7 Claims, 4 Drawing Figures



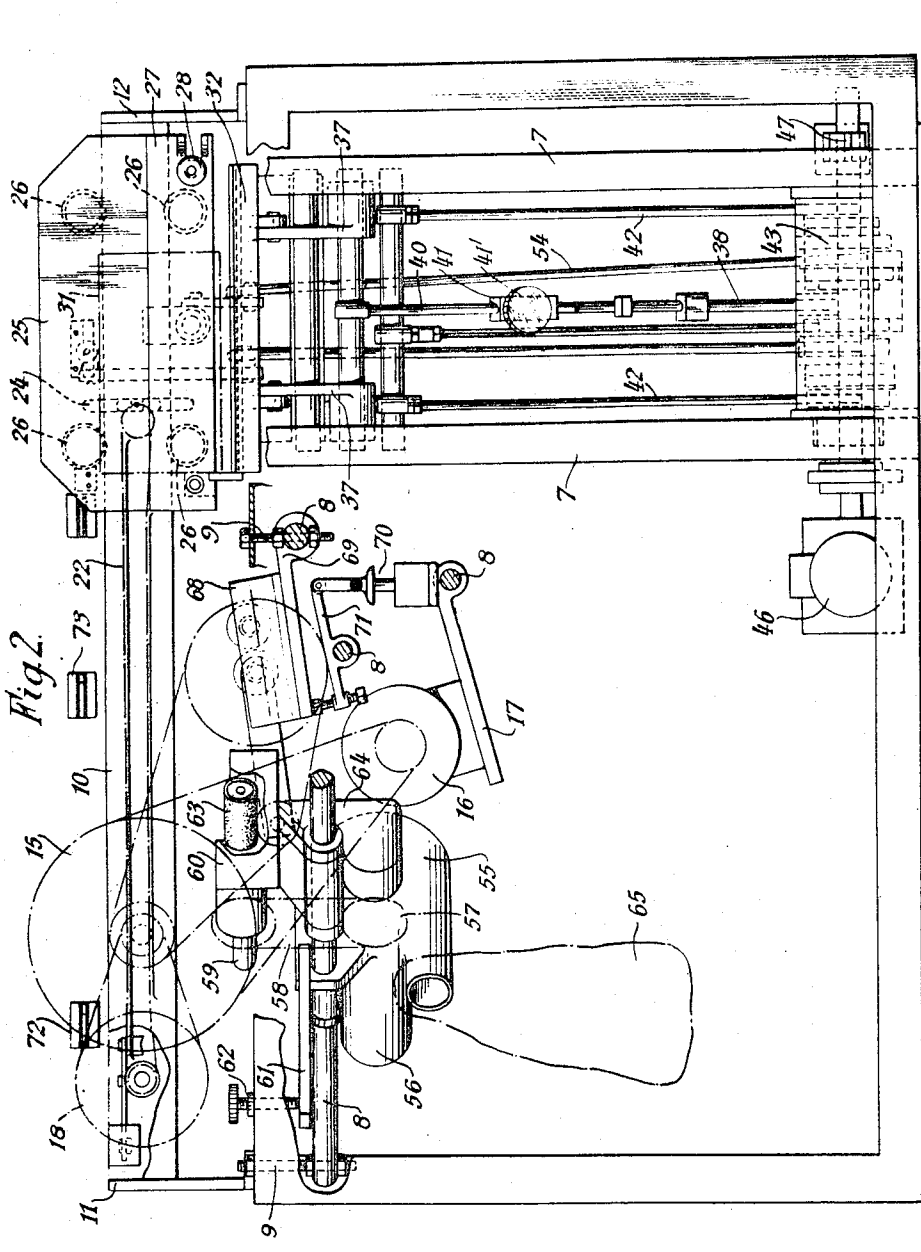


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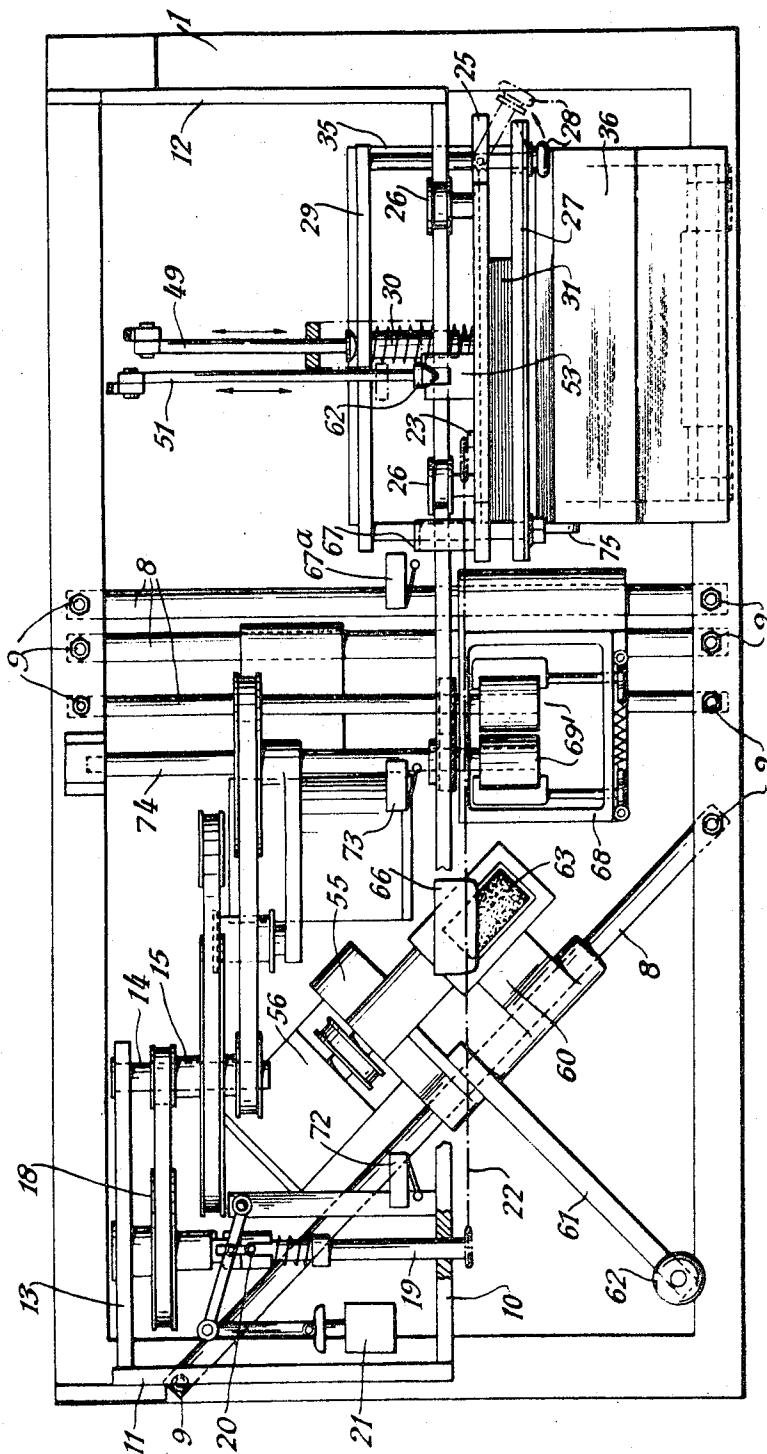


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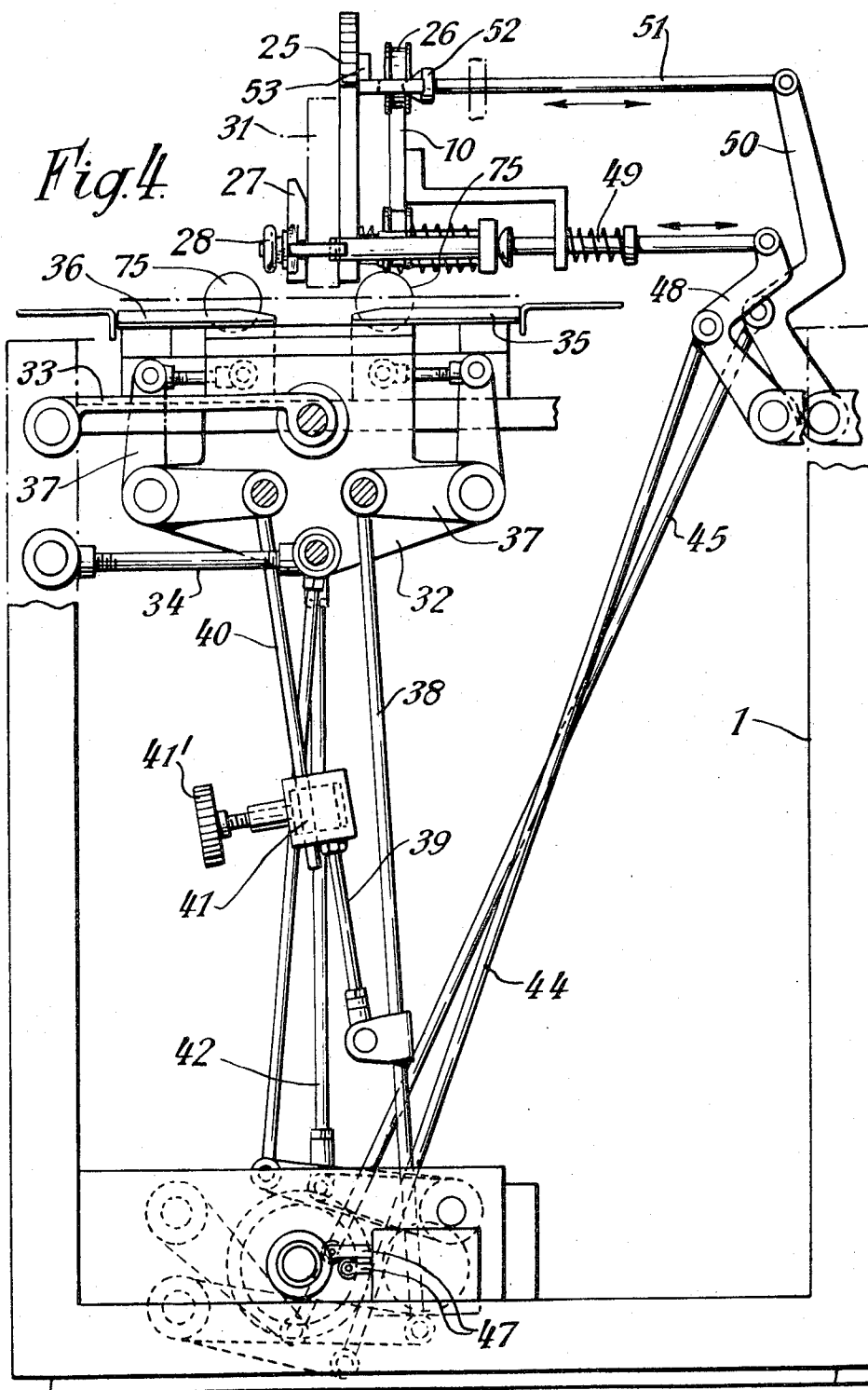
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Fig. 3



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BOOK BINDING

This invention is concerned with bookbinding.

The purpose of the invention is to provide a low cost machine for the production of what are known in the bookbinding industry as perfect or adhesive bound books and which is capable of producing books equal in quality and in a single process identical in every way with those produced on more expensive machines. The machine of the invention is, moreover, specially designed so that it can be operated by a single person.

The books so produced are bound by an adhesive only the same adhesive normally also serving to attach the cover which may be of paper board or plastic, or a lining of paper cloth or plastic. These books are distinct from those in which the binding is initially started by sewing either the individual sections or the entire book with thread or by staples or wire stitches. The machine of this invention can in fact also be used to apply a cover or lining to books which have been previously wire stitched or thread sewn.

According to the present invention there is provided a bookbinding machine including a clamp to receive the book to be bound, an operator's station at which the operator can insert a cover onto a device for applying the cover to the book, means for preparing the book back by abrading or cutting, means for applying adhesive to the prepared book back and means for moving the clamp in a rectilinear path from the operator's station to the same means and for returning the book along said path to the operator's station for the application of the cover.

In this specification the word "book" is used to designate the collated assemblage of pages without the cover.

The invention will now be described by way of example and with reference to the accompanying drawings wherein:

FIG. 1 is a perspective view of a machine in accordance with a particular embodiment of the invention. The operator's position is immediately in front of the hinged door at a right hand of the machine and that the main frame would be of a height slightly below the waist of an average woman;

FIG. 2 is a partially sectioned front view of the machine;

FIG. 3 is a top view of the machine with the guard cowls removed;

FIG. 4 is an end view of the machine showing the book carrying clamp and the cover applying means.

Referring initially to FIG. 1 a frame 1 is suitably constructed from angle iron or other sectioned material. A panel 2 encloses the front of the machine and a hinged door 3 permits easy access to the machine. A panel 4 for the end of the machine carries a number of switches and push buttons for the machine operation. Cowls 5 and 6 cover the top of the machine. Angle iron uprights 7 (see FIG. 2) are bolted or welded to the main frame 1. Shafts 8 are suspended from the top of the frame 1 on screwed studs 9 to allow easy adjustment for height. A straight rectangular bar 10 mounted on brackets 11 and 12 extends across the machine. A bar 13 is similar to 10 but shorter, and is also mounted on the bracket 11. A stationary shaft 14 has revolvably mounted on it a triple pulley 15 belt driven by a motor 16 which is mounted on a bracket 17 which pivots on one of the

shafts 8 thus providing continuous belt tension between the motor 16 and the triple pulley 15. A pulley 18 is driven by a belt from the triple pulley 15 and revolves freely on the shaft 19. A clutch 20 is operated by a solenoid 21 and connects the pulley 18 to drive the shaft 19 when the solenoid 21 is not energized. When solenoid 21 is energized the clutch is disengaged. The shaft 19 carries a chain sprocket at the end which drives a chain 22 this chain running round a free running idler sprocket at the other end of the chain. The chain 22 has an extended pin which has a trunnion block running in a slot 24 machined in the clamp body 25. The clamp body 25 is supported on four rollers 26 which run on the straight rectangular bar 10. A clamping plate 27 is carried on two studs one of which 28 has a pivotted end section which is lightly spring loaded to retain it in the straight position. The two studs carrying the clamping plate 27 are secured to a connecting bar 29 which has a guide stud 30 sliding in a socket attached to 25 a compression spring exerting force to draw the clamping plate 27 against the clamp body 25 to hold securely the book 31 which may be of any thickness within the maximum capacity of the clamp. A cover nipping unit 32 is mounted on a strong pivotted link 33 and maintained in position by a rod 34 so that the cover nipping unit 32 can be raised or lowered while remaining in a level position. Two nipping jaws 35 and 36 are slidably mounted on the plate of the cover nipping unit. The nipping jaws 35 and 36 are operated through a system of bell cranks 37 and draw rods 38 and 39 but to provide easy adjustment of the nipping jaw 36 the draw rod 39 is connected to a further draw rod 40 by a clamping device 41 which can be easily and rapidly freed and tightened. Two rods 42 raises the nipping unit 32 when required. A camshaft 43 has following levers which operate the rods 38 and 42 and the rods 44 and 45. The camshaft 43 is driven from a motor gear unit 46 and controlled by micro switches 47 in conjunction with push buttons mounted on the panel 4. The rod 44 when actuated by the camshaft operates the lever 48 which in turn operates the rod 49 to open the clamp when the clamp is in the position shown in FIGS. 1, 2 and 3. The rod 45 when actuated by the camshaft operates the lever 50 which operates a rod 51 so that it is urged forward to locate the clamp in exact position by a locating plunger 52 engaging in the locating plate 53 which is attached to the clamp body 25 to ensure that the clamp always locates in the same position to obtain exact register with a cover for the book which will be laying on the nipping unit top plate in a predetermined position. The cams are all of simple outlines requiring only turning when being machined with straight profiles which can be sawn or milled without elaborate cam cutting equipment. The various rods are provided with rod ends allowing adjustment of their effective length. With the camshaft in the normal static position the clamp is located and fully open to receive a book and the two nipping jaws open to their full movement. Pressure of one of the operating buttons on the panel 4 closes a relay which starts the motor 46 causing the camshaft to revolve until the circuit to the relay is opened by one of the micro switches 47 causing the camshaft to stop. During this partial revolution the clamp is first closed, then the nipping unit lowered, the locating plunger 52 withdrawn and the nipping unit lowered to leave the

back of the book clear. A second pressure on the operating button causes further revolution of the camshaft which first locates the clamp exactly, then raises the nipping unit to its original position momentarily closes the two nipping jaws to their fully closed position and finally opens the clamp so that the book may be removed. As it is sometimes desirable to increase the thickness of the glue film on the back of the book a cam is provided which through the rod 54 lifts the nipping unit momentarily just before the clamp closes thus raising the book by an amount determined by the length of the rod 54 which is adjusted to give the glue film desired. To allow easy adjustment for book thickness a large handwheel 41' is provided on the clamping device 41, and to allow the nipping jaws to be adjusted to the thickness of the book, an additional press button closes another relay which causes the camshaft to revolve and stop by a second micro switch so that the nipping unit is raised to its high position and the nipping jaws are in their closed position; the procedure therefore, to set the cover nipping unit for book thickness, is to loosen the clamping device 41 and draw by hand the front nipping jaw 36 to its fully open position, place a book in the open clamp and press the cover unit set button which closes the clamp, raises the cover nipping unit to its highest position and moves the nipping jaws to their closed position before stopping; the outer nipping jaw 36 is then pressed hard against the book and the clamping device 41 tightened; the first push button is then pressed which opens the nipping jaws; lowers the nipping unit and opens the clamp. A further pressure of this button causes the clamp to close and the nipping unit to drop leaving the book in correct position in the clamp.

A centrifugal extractor 55 driven by a motor 56 is so mounted on one of the shafts 8 as to be free to swing thereon. The shaft of the motor 56 carries between the extractor casing and the motor body a pulley 57 which drives through a belt 58 the shaft 59 of the book back abrader 60 which is also mounted on the shaft 8 being pivotal thereon. The extractor 55 and abrader are held together by the driving belt and kept the correct distance apart for belt tension by a bolt (not shown) screwed and locknotted into the abrader with its head against the extractor housing, the weight of the extractor and abrader tend to allow them both to swing together round the shaft 8 but are prevented from doing so by the bar 61 which is located by the screw 62 and thus rotation of the screw 62 causes the extractor and abrader to rotate on the shaft 8 and so raise or lower the abrader vertically. The abrasive band 63 is mounted on a suitable cylinder which has a rubber sleeve interposed between the cylinder and the abrasive band; a cap fitting over the cylinder can be tightened by a nut on the end of the abrader shaft which causes the rubber sleeve to be compressed endwise and swell in diameter thus gripping the abrasive band. Toothed cutting devices may be substituted for the cylinder to provide different finishes as required by different grades or types of paper. The cylinder is enclosed by a casing which at the bottom has an outlet which can be connected by a tube 64 to the inlet of the extractor so that the paper dust can be drawn off and deposited in a suitable filter bag 65. The abrader has a fixed shear edge 66 to support the book as it is being

roughened or cut and by setting the abrader at an angle rotation thereof imparts a force to the book back which holds it against the edge.

When the machine is in service the motor 16 is running continuously to drive the pulley 18 (and the glue unit to be described later). Switching the machine on closes a relay which energizes the solenoid 21 and draws the dog clutch 20 out of engagement, a third push button on the panel 4 opens the relay to release the solenoid and allow the sliding part of the dog clutch under the action of the spring to engage with the dog on the pulley 18, and thus transmit the drive to the shaft 19 and drive the chain 22 which through the extended pin on the chain and the trunnion block in the slot in the clamp draws the clamp 25 along the machine and then back to its original position where it is stopped by a plate 67 operating a micro switch 67a which closes the relay to withdraw the dog clutch out of engagement. It will be understood that a book in the clamp is carried over the abrader, the back of the book being cut and/or roughened, this being repeated as the book returns; the degree of roughening or cutting is adjusted by the screw 62 which raises the abrader to increase the roughening or cutting or lowers it to reduce.

A glue tank 68 (FIGS. 2 & 3) is held by screws on a heater plate 69, means being provided on the heater plate for keeping it at a controlled temperature by suitable electrical elements and a thermostat; in addition to the thermostat a heat adjuster is provided easily accessible from the inspection door in the front panel of the machine. The heater plate 69 pivots on one of the shafts 8 and can be raised or lowered by the solenoid 70 acting through the lever 71. In order to avoid fouling the abrader the glue unit is lowered while the book is passing over it. The glue unit is raised on the clamps return run. The micro switch 72 energizes a relay to pass current to the solenoid 70 and micro switch 73 breaks the circuit after the book has passed the glueing unit. The glue unit has two rollers 69' revolving in opposite directions being geared together, the shaft 74 being belt driven from the triple pulley 15. The shaft 74 runs in a self aligning bearing mounted on the main frame 1 of the machine and another bearing mounted on the heater plate 69. This allows for the small movement caused to the shaft when the glue unit is raised and lowered. There is an advantage in heating the glue unit from a separate heater plate because it allows the glue tank to be removed for cleaning without the complications of electrical connections and making complete replacement of the glue unit comparatively inexpensive. The glue unit has scrapers for each roller adjusted by screws to permit accurate control of glue metering.

All micro switches are preferably slidably mounted to allow easy adjustment to secure accurate timing.

Although micro switches are a convenient and inexpensive method of control, all the operative movements of the machine can be equally performed by straight mechanical or hydraulic, or pneumatic operation. If desired the nipping operation can be performed by pedals connected to the camshaft in place of power-drive.

It will be understood that all control of the machine and feeding the book and cover before binding and removing the finished book is all performed without the

need for the operator to move and in fact the operator can run the machine sitting down.

From the design it will be seen that all the component parts are easily adjustable so that a considerable degree of tolerance can be accepted on the manufacture. Further the design is such that the larger bulk of the machining required is turning or drilling which are the least costly of engineering processes.

For all normal size books the stud of the clamp at the left as facing the machine is used for location of the hook. To locate the cover two lays 75 are attached to the end of the nipping unit. Magnets can be used for locating the covers on the foredge when more than one book of the same size is to be processed.

The ease and speed of setting up the machine makes it quite economical to use it for making one book but at the same time runs of several hundred or more would not take undue time.

To make one book the cover must be marked on the inside to indicate where the cover will fold over the front corner of back; the operator then frees off the handwheel on the clamping device 41 and draws the outer nipping jaw 36 outwards to its full extent. The book is then jogged up on back and head and inserted in the open book clamp with the head against the clamp stud and the back resting on the top plate of the nipping unit. Pressure of the setting button then causes the nipping unit to rise to its high position and the nipping jaws close in to full nip; the operator then pushes the outer nipping jaw in hard against the book and locks up the handwheel, again pressing the nipping button opens the nipping jaw and lowers the nipping unit. The cover is then placed on the nipping unit and lined up to its correct position in relation to the book. The clamp cycling button is then pressed and the clamp carrying the book moves along the track and over the abrader where the back of the book is cut or roughened and while the clamp is just past the abrader the glue unit is raised so that the book is given a coat of adhesive before reaching its original position and stopping. The nipping unit push button is again pressed causing the nipping unit to rise pressing the cover against the glued back of the book and the nipping jaws to close in folding the cover sharply round the back corners of the book before opening again as the book clamp opens to allow the book to be removed sideways as the clamp stud 28 pivots out of the way. It will be appreciated that the whole of these operations are carried out in a few seconds, and considerably faster than would be possible by hand even if the book were bound first and hand methods used for applying the cover.

When a run of books is to be processed, the cover position on the nipping unit is located by lays such as magnets on the nipping jaws and the covers are placed in position immediately after the clamp cycling button

has been pressed.

Sewn or wire stitched books can be covered faster and to a higher standard than by hand, or a lining can be applied instead of a paper cover.

The feature which brings the book clamp back to the feeding station for completion by attaching and folding over the cover makes for a very short machine so that all adjustments can be made without the operator having to move from the operating position.

I claim:

1. A bookbinding machine including a clamp to receive the book to be bound, an elongate rectilinear guide for said clamp, means on said clamp for guiding the clamp along said rectilinear guides, means at a first end of said guide for opening the clamp to permit insertion of the book to be bound and additional means at said first end for applying a cover to the book, preparing means at the other end of said guide for abrading or cutting the back of said book, means at an intermediate position on said guide for applying adhesive to the prepared book back, means for moving the clamp in a rectilinear path along said guide from the first end to said preparing means and for returning the clamp along said path to the first end of said guide for applying the cover, and means for moving the adhesive applying means to an inoperative position when the clamp passes it on its way to the preparing means and to an operative position during the return trip of said clamp.

2. A machine according to claim 1 wherein the preparing means include a rotatable abrader and a locating element for the book, the abrader being so disposed that rotation thereof urges the book against the locating element.

3. A machine according to claim 1 wherein the preparing means and the adhesive-applying means are each carried by a pivotally secured support.

4. A machine according to claim 1 wherein means are provided for locating the clamp in correct register with the device said additional means for applying the cover.

5. A machine according to claim 1, comprising means for precisely setting the means for applying the cover relatively to the book before the book commences the outward path.

6. A machine according to claim 1 wherein the device for applying the cover comprises a pair of nipping jaws driven through appropriate linkages by a cam-shaft and wherein one of the jaws can be loosened from its linkage by means readily accessible to an operator at the front end of said guide whereby the machine can be set for the required book thickness.

7. A machine according to claim 6 comprising means on the said device for raising and lowering the jaws whereby the book can be set in the clamp to receive the desired thickness of glue.

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