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Sims

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[45] Feb. 26, 1974

[54] **BOOKBINDING AND POWERED PUNCH MACHINE**

[75] Inventor: **Raymond E. Sims,** Round Lake Beach, Ill.

[73] Assignee: **General Binding Corporation,** Northbrook, Ill.

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[52] **U.S. Cl.** ..... **11/1 AC**

[51] **Int. Cl.** **B42c 19/00**

[58] **Field of Search** ..... 11/1 R, 1 A, 1 AC

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Primary Examiner—Lawrence Charles

Attorney, Agent, or Firm—Hill, Sherman, Meroni, Gross & Simpson

[57] **ABSTRACT**

This invention provides a combination bookbinding and power punch machine for punching and binding sheets of paper into a book with a plastic binding edge. The bookbinding machine comprises a frame having a base, a row of punches mounted on the frame for vertical movement with respect to the base thereof and corresponding cooperating apertures spaced in the frame beneath the punches, a pressure bar disposed above the punches and mounted on the frame for vertical movement with respect to the punches, power means arranged for cooperation with the pressure bar for vertically moving the pressure bar in a punching and return direction. There are provided a stationary comb which extends upwardly from the frame and is spaced from the row of punches, and a slide member having uncurling fingers extending therefrom along the upright comb, the slide member being arranged to move transversely with respect to the frame along the comb and longitudinally of the frame toward and away from the comb. An adjustable punching back gauge plate is provided with adjustment means mounted on a common shaft to adjust both the position of the punching back gauge plate to correspond with the depth the holes are to be punched along the border of the sheets to be bound, and the movement of the slide member to correspond with the diameter of the binding element by which the punched sheets are to be bound.

8 Claims, 6 Drawing Figures

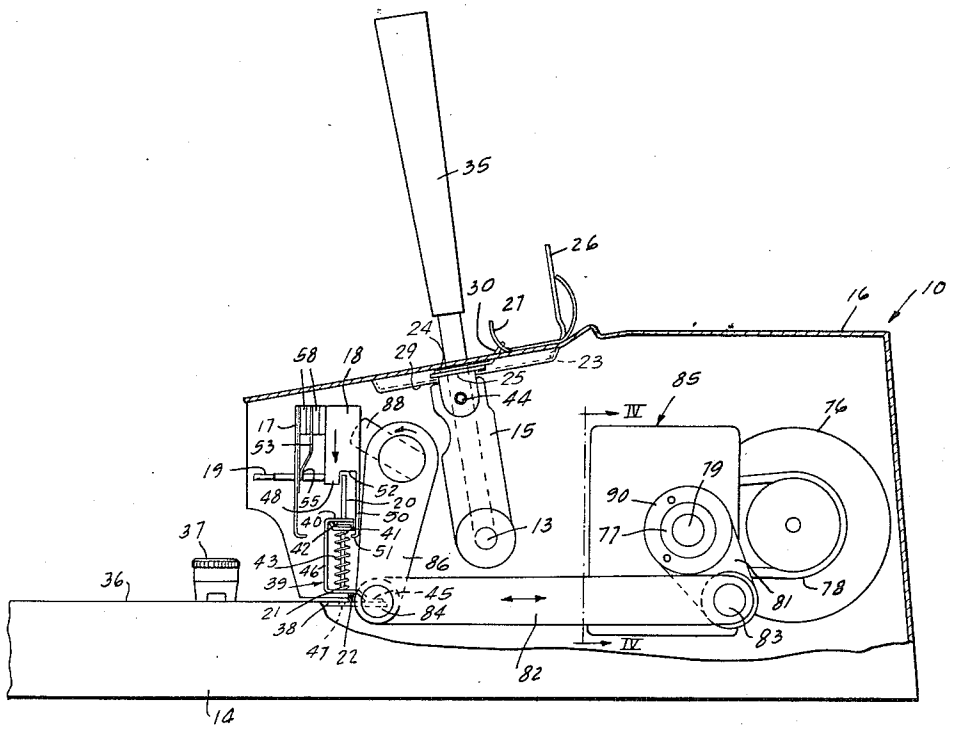


Fig. 1

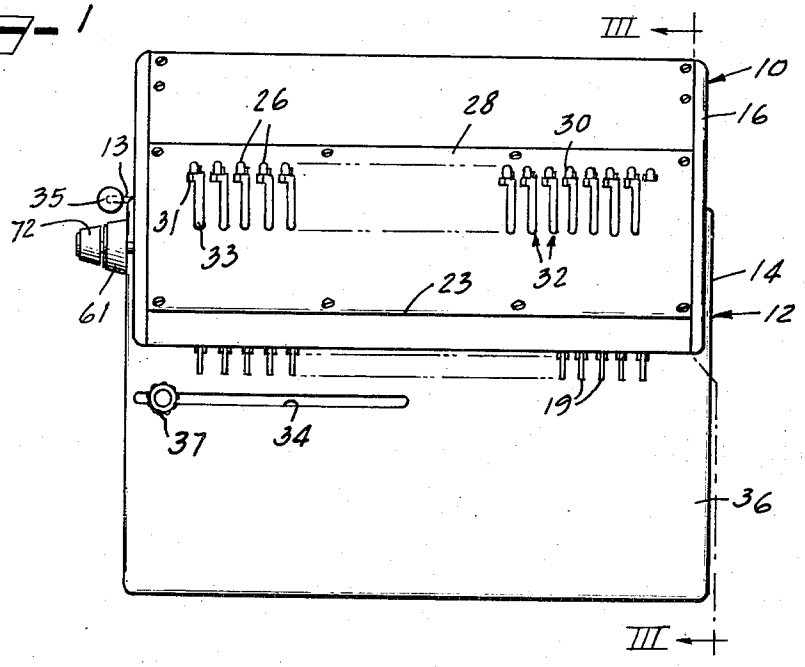
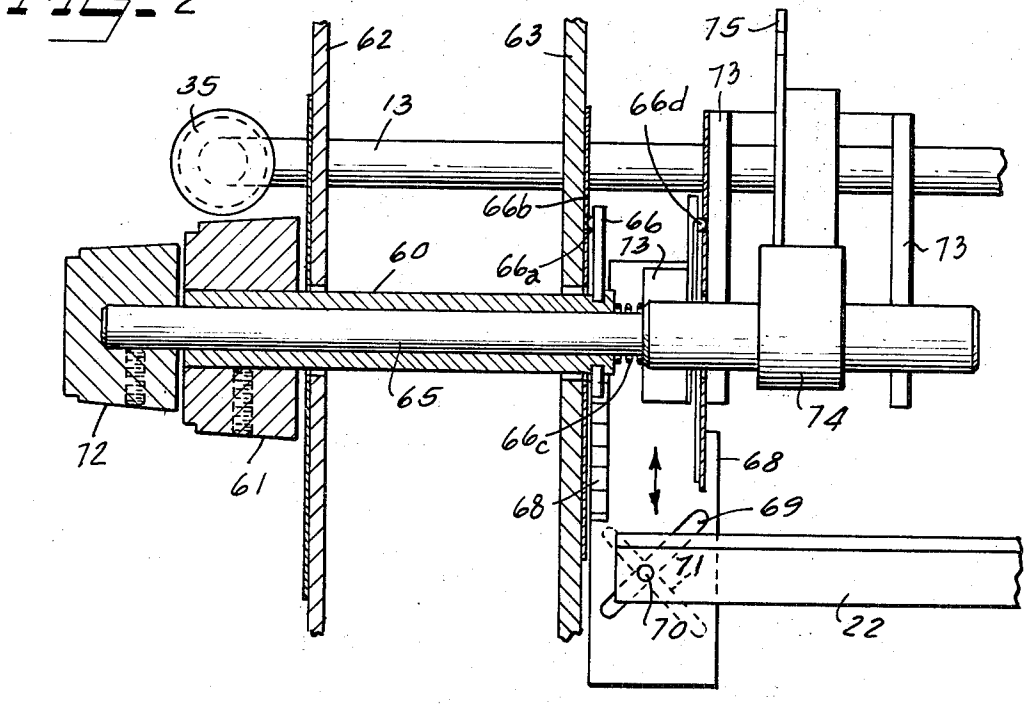

III
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Fig. 2


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66d
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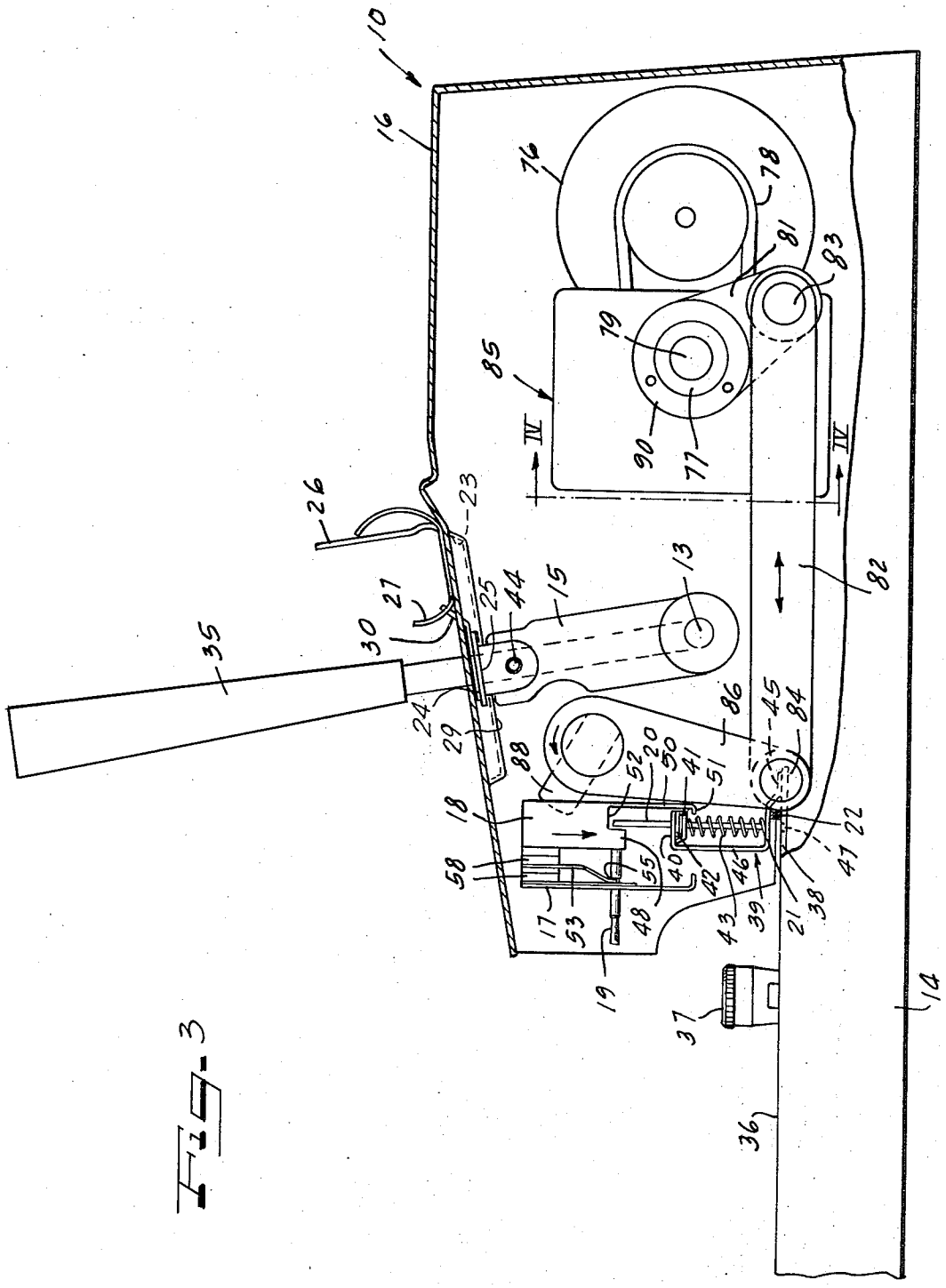

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Fig. 3

Fig. 4

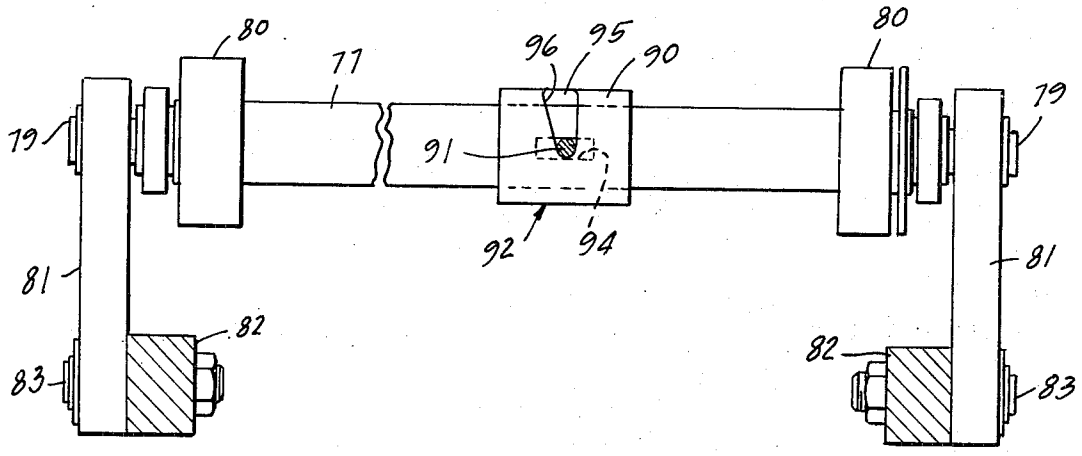


Fig. 5

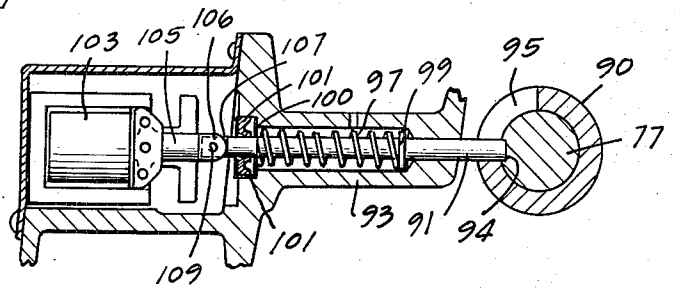
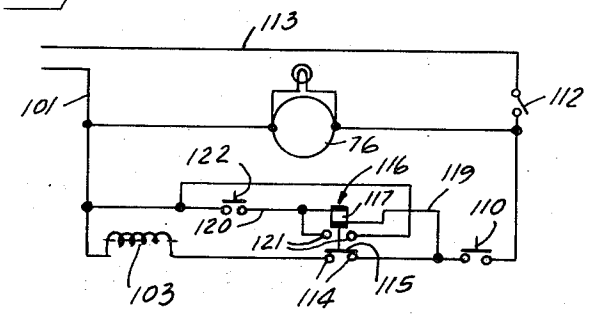


Fig. 6



BOOKBINDING AND POWERED PUNCH MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention is related to bookbinding machines and more particularly to a combination bookbinding machine having a powered punching action and a manually operated binding action.

2. Description of the Prior Art

There are several bookbinding machines which combine the punching operation and the binding operation in one machine. For the most part, these machines are manually operated and have the operations separated on the machine where they may be actuated by one handle which operates the punching aspect in one portion of its action and the binding aspect in another portion of its action. For example, the handle may be pulled forward to punch sheets of paper to be bound and then pushed backward or in the opposite direction to bind the punched sheets with a plastic element as is well known in the art.

Although the combination bookbinding and punching machines are effective and have been quite useful there is need for easing the physical task of punching. This is necessary in order to easily and quickly bind books of many paper sheets. While manually operated machines can be equipped with means for reducing the operator punching load which is generally done by a female, it is done so by greatly increasing the machine cost, shortening the life of the machine or lowering the esthetic values thereof which affects the marketability of the machine. Thus, there is a need for the punching aspect of the machine to be powered. This is desirable only if the punching aspect can be powered without excessive cost and without the possibility of impairing the binding operation of the machine.

It, therefore, would be an advance in the art if a bookbinding machine were developed that had a powered punch in combination with a simple low cost binder.

SUMMARY OF THE INVENTION

I have, accordingly, provided an improved bookbinding machine which has a powered punch action and a manually operated binder. The combination powered punching and binding machine for binding a stack of sheets with a binding element having a backbone and a resilient curled fingers comprises a frame having a base, a row of punches mounted on the frame and guided for vertical movement with respect thereto and cooperating apertures spaced beneath the punches in the base of the frame. A pressure bar is mounted on the frame for vertical movement with respect to the row of punches and power means are provided in cooperation with the pressure bar for vertically moving the pressure bar in a punching and return direction. An upright comb mounted on the frame has fingers extending upwardly therefrom which are engageable with the backbone of the binding element, the comb being spaced rearwardly of the punches. A slide member is movably mounted on the frame and has uncurling fingers extending therefrom along the comb. Guide means are provided for guiding the slide member for movement transversely of the frame along the comb and longitudinally of the frame away from the comb. An adjustable

punching back gauge plate is provided with adjustment means mounted on a common shaft to adjust both the position of the back gauge plate to correspond with the depth, or spacing, of the holes away from the edge of the sheets to be bound, and the movement of the slide member to correspond with the diameter of the binding element by which the punched sheets are to be bound.

It therefore is an object of the present invention to provide an inexpensive, efficient combination powered punching and binding machine for punching and binding sheets of paper into a book.

A more specific object of the present invention is to provide a combination powered punching and binding machine for punching and binding a stack of sheets of paper with a bookbinding element having a backbone and resilient curled fingers on which the stack of punched sheets are impaled.

Other objects, features and advantages of the invention will be readily apparent from the following description of the preferred embodiments thereof taken in conjunction with the accompanying drawings, although variations and modifications may be effected without departing from the spirit and scope of the novel concepts of the disclosure.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top plan view of a bookbinding machine constructed in accordance with the principles of the present invention;

FIG. 2 is a fragmentary top plan view of the back gauge and binding opening control mechanisms of the bookbinding machine shown in FIG. 1;

FIG. 3 is a side elevational view partially in section of the bookbinding machine taken substantially along the line III—III of FIG. 1 with certain parts removed;

FIG. 4 is a fragmentary transverse sectional view taken substantially along line IV—IV of FIG. 3 with certain parts removed;

FIG. 5 is an enlarged fragmentary detail sectional view showing certain details of the control mechanism for the one-way clutch, controlling operation of the punch; and

FIG. 6 is a wiring diagram showing the circuit diagram controlling the operation of the punch.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring initially to FIG. 1, a bookbinding machine 10 embodying the present invention is shown which includes a frame 12 having a base 14 and a detachable casing 16 enclosing the rear end portion of the punching mechanism and power means therefor and enclosing and forming a support and guide for the binding mechanism.

The casing 16 opens to the front of the machine to expose a guide plate 17, mounted on and extending in advance of a pressure bar 18 as illustrated in FIG. 3. The guide plate 17 with the pressure bar 18 form a guide means for a series of set pins 19 positionable to register with individual punches 20 to effect operation thereof in a selectable pattern.

The base 14 of the frame 12 has a front table or platform 36 in front of the pressure bar 18 and guide plate 17 upon which a stack of sheets (not shown) to be punched are placed and moved or inserted beneath a stripper plate 21 into engagement with a back gauge plate 22 adjustable to vary the positions of the punch

holes from the back of the stack of sheets as desired and described further hereinbelow.

The table **36** has a slot **34** extending transversely thereacross for a portion of the width of the table and parallel to the gang of punches **20.** The slot **34** has a stopper gauge **37** mounted therein for adjustable movement therealong to gauge the position of the punch holes with respect to the sides of the stack of sheets to be punched.

The casing **16** has a rectangular opening **23** in the top thereof extending substantially the width thereof and covering a ring uncurling slide member **24** extending along and relatively movable with respect to a slide bar member **25** as illustrated in FIG. **3.** The slide member **24** is first moved laterally of the casing **16** along an upright comb **26** to engage the binding rings **27** of a plastic binding element mounted on the comb **26** and is then moved away from the comb **26** by a handle **35** to uncurl the rings **27** of the binding element and retain the rings in position to accommodate the impaling of a stack of sheets thereon.

The upright comb **26** extends beneath the top of the casing **16** into the rectangular opening **23** and is mounted at its lower end on a support **29** mounted on the underside of the casing **16** and extending within the opening **23** in parallel thereto and extending forward of the comb **26** and sliding member **24** to the forward end portion of the rectangular opening **23.** The support **29** is secured at its forward end portion and mounted on the underside of the casing **16** and extending within the open portion **23** of the casing.

The uncurling slide member **24** has a plurality of uncurling hooks or fingers **30** extending angularly rearwardly and upwardly therefrom through widened laterally extending portions **31** of slots **32** extending through a cover plate **28** closing the opening **23.** The teeth of the holding comb **26** also extend through the widened portions **31** of the slot **32.** The slots **32** have longitudinally extending portions **33** in registry with the space between the fingers of the comb **26** and extending forwardly therefrom. The widened portions **31** of slot **32** thus accommodate movement of the uncurling fingers **30** of the slide member **24** along the teeth of the comb **26** into the spaces between its teeth to engage the rings **27** of a binding element extending in the spaces between the teeth of the comb **26** and to then move along the longitudinally extending portions **33** of the slots **32** in a forward direction away from the comb **26,** to uncurl the rings **27** of the binding element and accommodate a stack of sheets to be impaled thereon. The slots **32** besides forming openings for the uncurling hooks **30** also cooperate with the slide bar **25** to cam the uncurling slide member **24** laterally upon movement of the slide bar in a longitudinally backward direction.

The binding element rings shown may be of a type well known to those skilled in the art having a backbone and curled fingers extending therefrom such as are shown and described in the U.S. Pat. to Douvry No. 1,970,285, and are not fully shown herein and described in detail. The method of uncurling the rings of the binding element by moving the uncurling hooks or fingers **30** into the curled rings or fingers of the binding element and then by moving the uncurling hooks away from the comb **26** to uncurl the rings of the binding element while the backbone of the binding element is retained in position by the comb is also a conventional method except in the present binding machine, the handle **35** to which the uncurling slide member **24** is secured is pulled forward when the hooks or fingers **30** are engaged with the fingers **27** of the binding element to open the binding rings as illustrated in FIG. **3.**

The handle **35** is arranged to pivot a transverse shaft **13.** The shaft **13** is secured to a pivotal member **15** which is in turn secured to member **24** by pin **44.** When the curling slide member **24** engages the rings **27** of the binding element, the handle is pulled forward toward the front of the machine to open the binding rings.

The table **36** has die plates **38** recessed therein and flush with the top therof, having die sets **39** extending upwardly therefrom. The die plates **38** and die sets **39** may be placed in an end-to-end relation (not shown) to extend for the width of the casing **16** in a conventional manner, so need not herein be shown or described further.

Each die set **39** includes the die plate **38,** and associated stripper plate **21** extending thereabove and along the top of the back gauge **22.** It also includes the gang of punches **20** guided in the stripper plate **21** and a guide **40** spaced above the stripper plate, a stripper member **41** for the punches **20,** a pin **42** extending through each punch **20** and limiting the upward travel of the punch and also engaged by the stripper member **41** upon upward movement thereof to effect the positive stripping of the punches from the sheets being punched. Each die set also includes springs **43** encircling certain punches and interposed between the upper side of the stripper plate **21** and the underside of the stripper member **39** and biasing the stripper member **39** into engagement with the pins **42.**

The stripper plate **21** has a downwardly stepped rear end portion **45** engaging the die plate **38** and supporting the stripper plate **21** on the die plate **38** in a vertically spaced relation with respect thereto. The stripper plate **21** also has an upward forward end portion **46** from which the guide plate **40** is turned inwardly.

The punches **20** are rectangular in form and extend through rectangular openings (not shown) in the guide plate **40** and through corresponding aligned rectangular openings (not shown) in the stripper plate **21** and cooperating apertures **47** in the die plate **38.**

The pressure bar **18** is shown as being of an inverted U-shaped formation having a short front leg **48** and a longer rear leg **50** extending downwardly beneath the guide plate **40** along the rear end portion thereof and having inturned end portions **51** extending under the stripper member **41** for positively moving the stripper member upwardly upon upward movement of the pressure bar **18,** to strip the punches **20** from the stack of sheets being punched.

As previously mentioned, the set pins **19** are slidably guided in the guide plate **17** and pressure bar **18** and are positionable to extend within the slot **52** to effect a punching operation and are movable outside of the slot outside of registry with the associated punch **20** to render the punch ineffective to effect a punching operation. The set pins **19** are moved into their effective and ineffective positions by manually pulling or pushing thereon, and are retained in their effective and ineffective positions by the over center posisions of leaf springs **53.** The leaf springs **53** are shown in FIG. **3** as being mounted between spacer bars **58,** spacing the guide plate **17** outwardly with respect to the pressure bar **18.**

The lower end portions of the leaf springs **53** extend within slots **55** formed in the set pins **19.** It may be seen from FIG. **3** that leaf springs **53** are moved past a dead center position when the set pins **19** are in their inwardly extended effective positions and thereby hold the set pins in their effective and ineffective positions during oscillatory movement of the pressure bar **18,** and enable the punching pattern to be selected at the will of the operator without removing the set pins from the pressure bar **18.**

The back gauge **22** is adjustably mounted in the space between the die plate **38** and the stripper plate **21** and may be adjustably moved with respect to the punches **20** by the back gauge adjusting means shown in FIG. **2.** Also shown in FIG. **2** are the binding opening adjustment means for limiting the movement of the uncurling slide **24** along slots **31** to correspond with the size or diameter of the binding element on which the sheets of paper are to be impaled.

As shown in FIG. **2,** the back gauge adjustment means include a back gauge adjustment shaft **60** on which an adjustment knob **61** is mounted to be pushed in and turned to adjust the position of the back gauge bar **22.** The shaft **60** is mounted on the end frame **62** and side frame **63** which extend upwardly of the table top **36** beneath the casing **16** and which form the bearing support members for the back gauge adjustment shaft **60,** and with frame supports **73** the binding opening adjustment shaft **65.** Mounted at the inward end of the back gauge shaft **60** is a back gauge pinion and stop member **66** which is arranged to engage a back gauge rack **68** to move the rack forward and backward in the directions of the arrow shown in FIG. **2,** by the turning of the adjustment knob **61.** The back gauge bar **22** has a nib **70** which is in a camming engagement with a diagonal slot **69** in the back gauge rack **68** and a second slot **71** in the rigid base of the apparatus. A second slot parallel to **71** is provided at the right end of bar **22** for cooperation with a second pin **70.** Accordingly, by pushing and turning the knob **61** stop member **66** is rotated moving the rack **68** forward or backward whereby the camming engagement of the slots **69,71** with the nib **70** moves the back gauge bar **22** in a parallel path to a desired position of adjustment. Detent **66a** operates in cooperation with arcuately spaced openings **66*b***, to provide a plurality of angular positions of adjustment of the back gauge. The detent is overcome by pressure knob **61** inwardly to the right against spring **66*c*** before turning the knob.

As shown in FIG. **2,** the binding opening shaft **65** is telescopically mounted within the back gauge adjustment shaft **60** and has an adjustment knob **72** which is initially pulled outwardly against spring **66*c*** and, after thus releasing detent **66*d***, is then rotated to adjust and limit the movement of the uncurling slide member **24** according to the size or diameter of the binding element to be opened. On the inner end of the binding opening shaft **65** is an index cam stop **74** which is set by the adjustment knob **72** according to the size of the binding element to be opened. The index stop **74** limits the movement of the arm **75** rigidly carried by shaft **13** thereby limiting rotation of shaft **13.** Accordingly, the movement of the handle **35** which is pivotally mounted on shaft **13,** is limited and controlled and with it, movement of slide **24.**

Referring now in particular to the drive means for moving the pressure bar **18** up and down, a motor **76** as shown in FIG. **3** is mounted on the base **14** of the main frame **12.** The motor **76** may be any well known form of electric motor, and is shown as driving a transverse drive shaft **77** through a pulley and belt drive **78,** and mechanical gear reducer **85.** As shown in FIG. **4,** where the reducer **85** is not shown, the drive shaft **77** is suitably journalled in the main frame **12** in spaced bearings **80.**

As shown in FIG. **3,** the drive shaft **77** is connected to rocking arms **86** by a crank assembly which includes driving cranks **81** extending from the drive shaft **77** and connected to links **82** by pivotal shafts **83.** The links **82** as shown are connected pivotally to the cranks **86** which have actuator pins **88** that engage the pressure bar **18** as known in the prior art. Thus, when the drive shaft **77** is rotated, there is a reciprocating motion of the links **82** which causes the cranks **86** to move the pins **88** downward against the pressure bar **18** to move the pressure bar vertically downward on the punches to in turn move them downward through a stack of sheets of paper under the stripper plate **21.**

As shown in FIG. **4,** a clutch sleeve **90** which is a part of a one revolution clutch **92** is journalled on the drive shaft **77.** As illustrated in FIG. **5,** the drive shaft **77** is prevented from rotation by a pin **91,** slidably guided in a guide frame part **93** of the main frame **12** and engageable with a slot **94** formed in the shaft **77** to positively hold the shaft **77** from rotation when the pin **91** is in its inwardly extended position shown in FIGS. **4** and **5.**

The pin **91** extends within a camming slot **95** formed in the clutch sleeve **90** and opening to the shaft **77** and slot **94.** The camming slot **95** has an angular camming surface **96** engaged by the pin **91** by the bias of a spring **97** to effect a non-rotation of the drive shaft **77** as the pin **91** is engaged with the camming slot **95** by the spring **97.** The spring **97** is seated at one end on a collar **99** pinned or otherwise secured to the pin **91** and is seated at its opposite end on a casing **100** for a seal **101.**

The pin **91** is withdrawn from the slot **94** and the camming slot **95** by a solenoid including an electromagnetic coil **103,** and an armature **105,** having bifurcated end portion **106** extending along opposite sides of a flattened portion **107** of the locking pin **91** and connected thereto as by a pin **109.**

The electromagnetic coil **103** is shown in FIG. **6** as being energized upon the closing of a switch **110,** which may be a foot switch. As shown, the electromagnet **103** is energized through main line conductors **111** and **113** through the main starting switch **112.** The foot switch **110** and the stationary and movable contacts **114** and **115,** respectively of a relay **116.** The relay **116** includes a coil **117** initially energized through conductors **119** and **120** and a switch **122** upon closing of the foot switch **110.** This will open the circuit through the stationary and movable contacts **114** and **115** and deenergize the electromagnet **103** and will close a circuit through holding contacts **121** and the movable contact **115,** holding the coil **117** energized and the switch **115** open after the punching operation.

As the pins **88** are moved downwardly to effect the punching operation by pressing the pressure bar **18,** one rocking arm **86** comes into engagement with the switch **122** to close the switch and complete an energizing circuit to the coil **117** and effect closing of a circuit through the stationary and movable contacts **121** and **115,** holding the coil **117** energized upon opening of the switch **122** by upward movement of the rocking

arm **86** as long as the foot switch **110** is in its closed position. This prevents closing of a circuit through the stationary contacts **114** and energizing of the electromagnet **103** until the foot is removed from the foot switch **110** and the relay **116** is reset and thereby prevents continued reciprocation of the pressure bar **18** and operation of the punches **20** in cases where the punches may once be operated and the foot may remain on the foot switch **110.**

While I have herein shown and described one form in which my invention may be embodied, it should be understood that various modifications and variations in the invention may be effected without departing from the spirit and scope of the novel concepts thereof as defined in the appended claims.

I claim as my invention:

1. A combined powered punching and manual binding machine for binding books with an element having a backbone and resilient curled fingers, said machine comprising:

a frame having a base;

a row of punches mounted on said frame and guided for vertical movement with respect thereto;

a pressure bar disposed above said row of punches and guided for vertical movement with respect to said punches;

power means mounted on the base of said frame for vertically moving said pressure bar in a punching and return direction;

a stationary comb extending upwardly from said frame, said comb being engageable with the backbone of said binding element;

a slide member having uncurling fingers extending therefrom along said comb, said slide member being arranged to move toward and away from said comb;

a back gauge bar movably mounted within said frame and spaced rearwardly of said punches, said bar being arranged to move toward and away from said punches while remaining parallel thereto; and

adjustment means supported on said frame for both said uncurling slide member and said back gauge bar, said means being mounted for relative axial and rotational movement on concentric shafts and having means thereon to interrupt adjustably movement of said slide member and to position said back gauge bar with respect to said punches.

2. A machine according to claim **1,** wherein the adjustment means for adjusting the back gauge bar includes a rack movable longitudinally with respect to said frame by rotation of one of said shafts, said rack having a camming engagement with said back gauge bar to move the bar to a predetermined position with respect to the punches.

3. A machine according to claim **1,** wherein the adjustment means for said uncurling slide member includes a cam carried by one of said shafts and adjustably positioned in the path of means moving with the handle by which the slide member is moved.

4. A machine according to claim **1,** wherein the power means include reciprocating bell cranks connected to rocking arms engaged with said pressure bar.

5. A machine according to claim **2,** wherein said rack has a diagonal slot in a camming engagement with a nib extending from said back gauge bar, whereby the movement of the rack positions the back gauge bar.

6. A machine according to claim **1** wherein each of said concentric shafts is held in adjusted angular position by a detent disengaged by axial movement of the respective shaft.

7. A machine according to claim **6** wherein the said concentric shafts are moved axially in opposite directions to disengage their respective detents in preparation for respective rotational adjustment.

8. In an apparatus for punching and/or binding a plurality of sheets, including a punch having a plurality of reciprocal punches and cooperating dies, electric motor drive means for actuating said punches including a clutch and a manual switch operable for engaging said clutch to reciprocate said punches once upon each actuation of said switch, and a binding apparatus including a cooperating comb and slide elements for respectively supporting and uncurling a multi-toothed binding member upon separation of said elements, the improvement comprising means for adjustably separating said elements by a pulling movement of a manual lever in the forward direction toward the operator, said means including a pivot for said lever below said elements and a connection between said lever and said slide elements above said pivot.

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