Jan. 4, 1966 W. A. BOUVIER 3,227,023

SUCCESSIVELY ACTING PUNCHING MACHINE

Original Filed Nov. 20, 1961 2 Sheets-Sheet 1

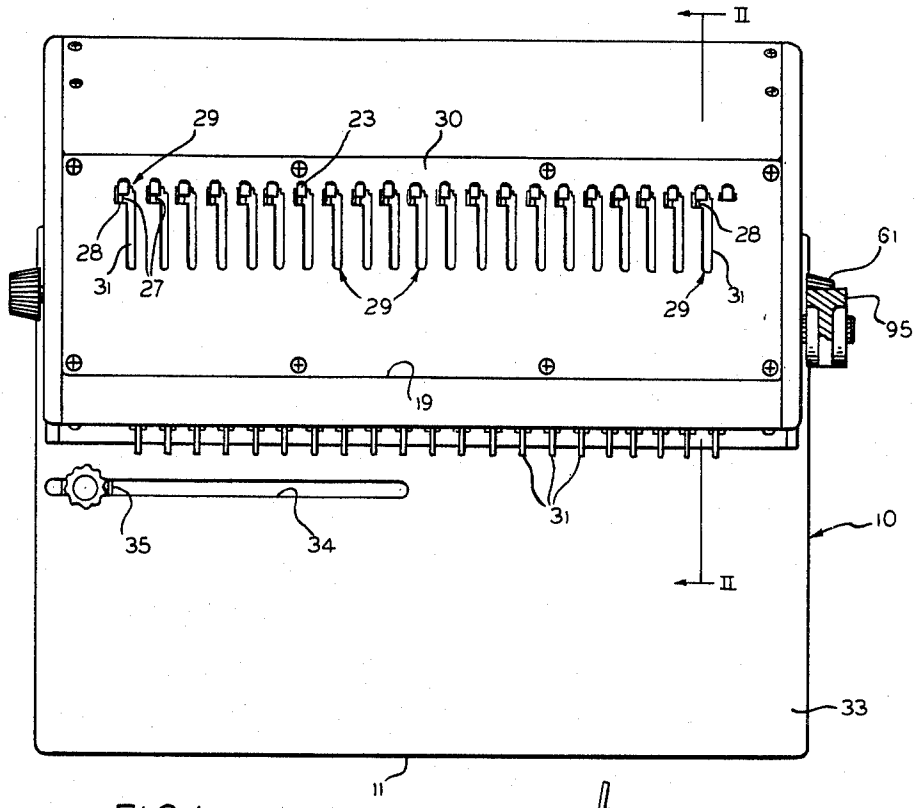


FIG. 1

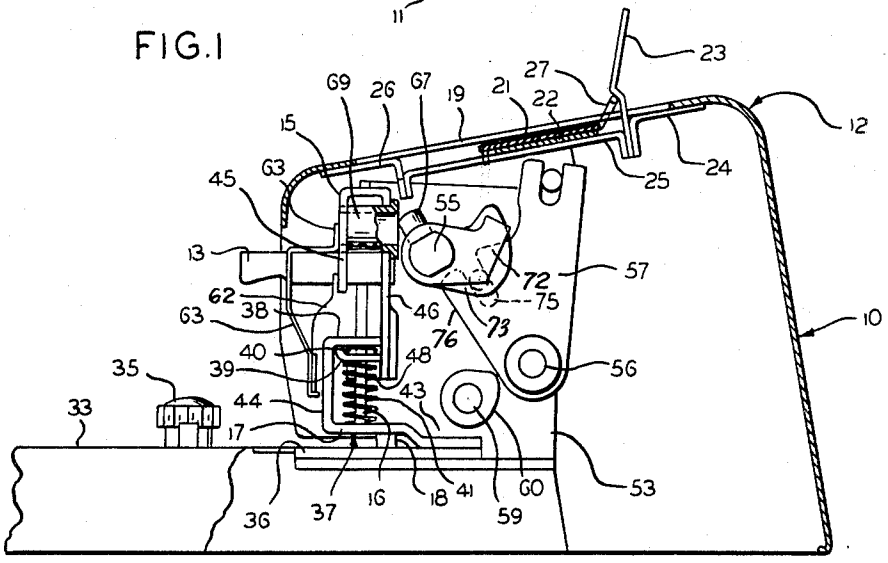


FIG. 2

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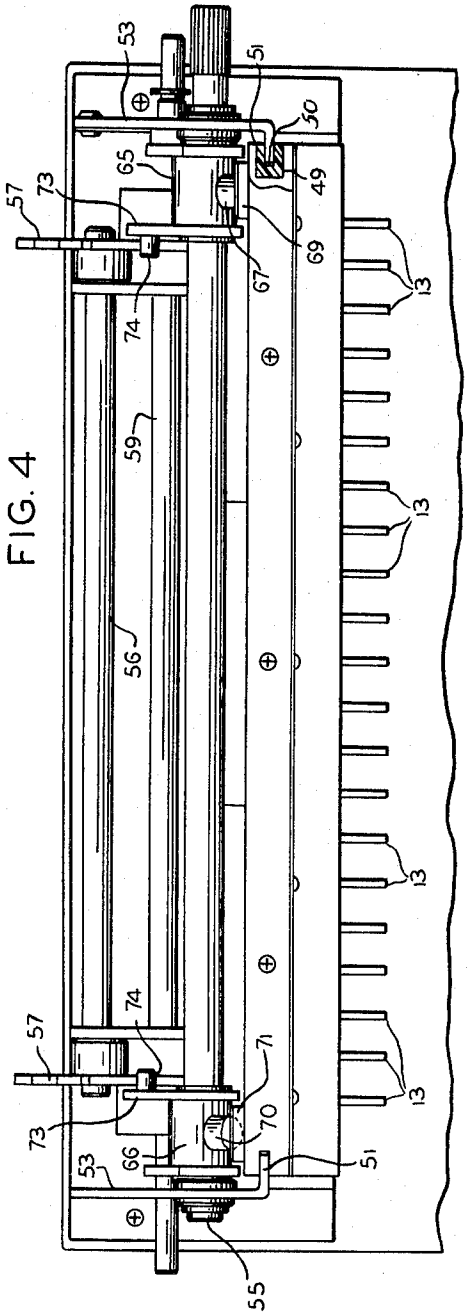


FIG. 4

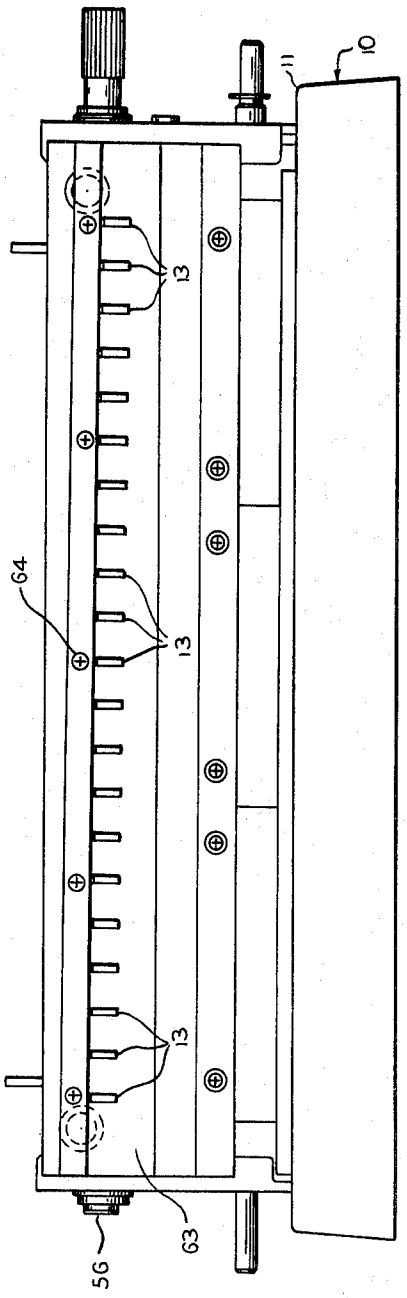


FIG. 3

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United States Patent Office 3,227,023 Patented Jan. 4, 1966

3,227,023

SUCCESSIVELY ACTING PUNCHING MACHINE

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Original application Nov. 20, 1961, Ser. No. 153,533, now Patent No. 3,122,761, dated Mar. 3, 1964. Divided and this application Sept. 16, 1963, Ser. No. 309,241

6 Claims. (Cl. 83—549)

This application is a division of my application Serial No. 153,533, filed November 20, 1961, now U.S. Patent No. 3,122,761.

This invention relates to improvements in book binding machines and more particularly relates to an improved form of gang punching machine for punching a stack of sheets for binding with ring-like plastic binding elements.

A principal object of the present invention is to provide an improved form of gang punching machine having a mechanism for successively operating the punches of a gang of punches arranged with a view towards utmost simplicity and efficiency in construction and operation.

Another object of the invention is to provide a simplified drive arrangement for a gang of punches for a combined punching and binding machine, in which the actuator for the pressure bar driving the punches to effect a punching operation effects successive operation of the punches from one end of the pressure bar to the other.

Still another object of the invention is to provide an improved form of gang punch utilizing set pins slidably carried in the reciprocating punch bar to select a desired punching pattern and to arrange the set pins in the pressure bar along an inclined path from one end of the pressure bar to the other to effect successive operation of the punches from one end of the pressure bar to the other.

These and other objects of the invention will appear from time to time as the following specification proceeds and with reference to the accompanying drawings wherein:

FIGURE 1 is a top plan view of a book binding machine constructed in accordance with the principles of the present invention, with the operating handle therefor broken away and shown in section;

FIGURE 2 is a fragmentary sectional view of the machine shown in FIGURE 1 taken substantially along line II—II of FIGURE 1;

FIGURE 3 is a front end view of the machine shown in FIGURE 1 with certain parts removed; and

FIGURE 4 is a top plan view of the punch assembly with the cover therefor removed, and showing the actuators for the gang punches and binding element.

In the embodiment of the invention illustrated in the drawings, I have shown a book binding machine 10 in FIGURES 1 and 2, including a base or main frame 11 having a detachable casing 12 enclosing the rear end portion of the punching mechanism and actuating mechanism therefor and enclosing and forming a support and guide for the binding mechanism.

The casing 12 opens to the front of the machine to afford access to set bars 13, slidably guided in a pressure bar 15, to select the punching pattern of a gang of punches 16. The open front of the casing 12 also accommodates a stack of sheets (not shown) to be inserted beneath a stripper plate 17, into engagement with a back gauge 18, gauging the spacing of the punched holes from the inner edge of the stack of sheets.

The casing 12 also has a rectangular opening 19 in the top thereof (FIGURES 1 and 2) extending substantially the width thereof and covering ring uncurling slide

member 21 extending along and relatively movable with respect to a slide bar member 22 forming an actuator for said uncurling slide. The slide member 21 is first moved laterally of the casing 12 along a comb 23, to engage the binding rings of a plastic binding element (not shown), mounted on said comb 23, and is then moved away from the comb 23, to uncurl the rings of the binding element and retain said rings in position to accommodate the impaling of a stack of sheets thereon.

The comb 23 extends beneath the top of the casing 12 into the rectangular opening 19, and is mounted at its lower end between the downwardly extending right angled portions of a support 24, mounted on the underside of the casing 12 and extending within the opening 19, and parallel spaced supports and guides 25 extending forwardly of the support 24 to the forward end portion of the rectangular opening 19. The supports and guides are secured at their forward end portions to angle brackets 26 mounted on the underside of the casing 12 and extending within the open portion 19 of said casing.

The uncurling slide 21 has a plurality of uncurling hooks or fingers 27 extending angularly rearwardly and upwardly therefrom through widened laterally extending portions 28 of slots 29 extending through a cover plate 30 closing the rectangular opening 19. The fingers of the holding comb 23 also extend through the widened portions 28 of the slots 28. The slots 29 have longitudinally extending portions 31 in registry with the space between the fingers of the comb 23, and extending forwardly therefrom. The widened portions 28 of the slots 29 thus accommodate movement of the uncurling fingers 27 along the teeth of the comb 23 into the spaces between said teeth to engage the rings of a binding element (not shown) extending in the spaces between the teeth of the comb 23, and to then move along the longitudinally extending portions 31 of said slots in a forward direction away from the comb 23, to uncurl the rings of the binding element and accommodate a stack of sheets to be impaled thereon. The slots 29 besides forming openings for the uncurling hooks 27 also cooperate with the slide bar 22 to cam the uncurling slide 21 laterally upon movement of said slide bar in a longitudinally forward direction, as will hereinafter more clearly appear as this specification proceeds.

The binding elements (not 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. Patent to Douvry, No. 1,970,285, so not herein shown or described in detail. The method of uncurling the rings of the binding element by moving the uncurling hooks or fingers 27 into the curled rings or fingers of the binding element, and then by moving the uncurling hooks away from the comb 23 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, so need not herein be shown or described further.

The main frame or base 11 also has a front table or platform 33 in front of the gang punches 16, upon which a stack of sheets may be placed, to effect a punching operation thereof. The table 33 has a slot 34 extending transversely thereacross for a portion of the width of the table, and parallel to the gang punches 16. The slot 34 has a stopper gauge 35 mounted therein for adjustable movement therealong, to gauge the position of the punched holes with respect to the sides of the stack of sheets to be punched.

The table 33 has die plates 36 recessed therein and flush with the top thereof, having die sets 37 extending upwardly therefrom. The die plates 36 and die sets 37 may be placed in end-to-end relation to extend for the

width of the casing 12 in a conventional manner, so not herein shown or described further.

Each die set 37 includes the die plate 36, an associated stripper plate 17 extending thereabove and along the top of the back gauge 18. It also includes a gang of punches 16 guided in said stripper plate and a guide 38 spaced above said stripper plate, a stripper member 39 for the punches 16, a pin 40 extending through each punch 16 and limiting upward travel of the punch, and also engaged by the stripper member 39 upon upward movement thereof, to effect the positive stripping of the punches from the sheets being punched. Each die set also includes springs 41 encircling certain punches and interposed between the upper side of the stripper plate 17 and the underside of the stripper member 39 and biasing the stripper member 39 into engagement with the pins 40.

The stripper plate 17 has a downwardly stepped rear end portion 43 engaging the die plate 36 and supporting said stripper plate 17 on said die plate 36 in vertically spaced relation with respect thereto. The stripper plate 17 also has an upright forward end portion 44 having a guide 38 turned inwardly therefrom.

The punches 16 are rectangular in form and extend through rectangular openings (not shown) in the guide 38 and through corresponding aligned rectangular openings in the stripper plate 17 and guide plate 36.

The back gauge 18 is adjustably mounted in the space between the die plate 36 and the stripper plate 17 and may be adjustably moved with respect to the punches 16 by a conventional adjusting mechanism, which is no part of the present invention so need not be shown or described further.

The pressure bar 15 is shown as being of an inverted U-shaped formation having a short front leg 45 and a longer rear leg 46 extending downwardly beneath the guide 38 along the rear end portion thereof and having inturned end portions 48 extending under the stripper member 39 for positively moving said stripper member upwardly upon upward movement of the pressure bar 15, to strip the punches 16 from the stack of sheets being punched.

The pressure bar 15 also has bearing slides 49 mounted in opposite ends thereof, between the legs 45 and 46 thereof (FIGURE 4). The bearing slides 49 may be made from Teflon or nylon or any other suitable bearing material, and each has an outwardly opening vertical slot 50 extending therealong having slidable bearing engagement with a vertically extending inturned end portion 51 of a side frame member 53.

The side frame members 53 extend upwardly of the table top 33 beneath the casing 12 and form bearing support members for a rock shaft 55 for operating the pressure bar 15, a rock shaft 56 for actuators 57 for the slide bar 22, and a shaft 59 for stop cams 60, limiting movement of the uncurling side 21 along the slots 31, and adjustably moved by a knob 61 on the outside of the casing 12.

The pressure bar 15 is provided with a plurality of aligned apertures (not shown) extending through the legs 45 and 46 of said pressure bar and slidably receiving the set bars 13, to support said set bars for movement into or out of registry with associated punches 16, to render said punches effective or ineffective to effect a punching operation.

The set pins or bars 13 are shown as being located along a line, which in FIGURE 3 is inclined upwardly from the right to the left hand side of the machine when looking toward the front of the machine. This progressively spaces the set bars upwardly from the right to the left hand side of the machine to provide successive operation of the punches 16 from the right to the left hand side of the machine and to thereby reduce the effort required to effect a punching operation, over what would be required if all of the punches were simultaneously actuated to be punched through a stack of sheets.

The front of the pressure bar is covered by a cover 63, secured to the pressure bar as by machine screws 64, and apertured to accommodate the set bars 13 to slidably extend therethrough. The set bars 13 have downwardly opening slots (not shown) engageable with leaf springs 62 to retain said set bars in their effective or ineffective positions, to effect a punching operation. The cover 63 extends along the set bars 13 for a portion of the length thereof and then downwardly therefrom, and angularly inwardly along the front of the vertically extending forward end portion 44 of the guide 37, and is relatively movable with respect to said forward end portion, upon operation of the pressure bar 15.

The pressure bar 15 is actuated to first depress the end thereof, which is the right hand end when looking toward the front of the punch in FIGURE 3 and to then depress the left hand end thereof to angularly move the pressure bar to effect pressure on the first punches to be engaged by the respective set bars 13 and then to successively engage and depress the next succeeding punches for the entire length of the gang punch.

As shown in FIGURES 2 and 4, the rock shaft 55 has hubs 65 and 66 mounted thereon adjacent opposite ends thereof, the hub 65 being adjacent the end of the shaft 55 which is the right hand end thereof when looking at the shaft in FIGURE 4, and the hub 66 being adjacent the left hand end of said shaft. The hub 65 has an actuator pin 67 projecting radially therefrom engageable within a flanged bushing 69 mounted in the legs 45 and 46 of the pressure bar 15. The pin 67 cams the bushing 69 to depress the pressure bar 15 upon turning of the rock shaft 67 in a direction, which in FIGURE 2 is shown as being a counterclockwise direction. A stop lever 72 is mounted on the hub 65 to limit depressible movement of the pressure bar 15. The hub 66 has a similar actuator pin 70 projecting radially therefrom and angularly offset with respect to the actuator pin 67, to come into engagement with a bushing 71 like the bushing 69, after the actuator pin 67 has come into engagement with its associated bushing 69.

Turning of the shaft 55 in a counterclockwise direction will thus first depress the right hand end portion of the pressure bar 15 and then engage the actuator pin 70 with the left hand end portion of said pressure bar and move the right and left hand end portions of said pressure bar downwardly together, to effect the successive operation of the punches 19 from the right to the left hand side of the machine.

The rock shaft 55 is rocked by a hand lever 95 on the outer end thereof. The hand lever 95 also operates an actuating lever 73 on said rock shaft, which operates the lever 57 to actuate the ring slide 21, through a pin 74 on the actuating lever 73 slidably engaging a slot 75 in the lever 57, as has been clearly shown and described in my parent application Serial No. 153,533, so not herein shown or described further.

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 attained without departing from the spirit and scope of the novel concepts thereof.

I claim as my invention:

1. In a book binding machine,
   (a) a frame,
   (b) a gang of punches guided on said frame for vertical movement with respect thereto,
   (c) a pressure bar guided for vertical movement with respect to said punches,
   (d) and actuating means moving said pressure bar angularly in a downward direction to first engage an end punch of said gang of punches and then successively engage the remainder of the punches of said gang of punches,
   (e) comprising a rock shaft,
   (f) means for rocking said shaft,
   (g) two spaced actuators on said rock shaft adjacent op-

posite ends thereof and angularly offset with respect to each other to effect operative movement of one actuator at one end of said pressure bar to actuate one end of said pressure bar, and then effect operative movement of the other actuator at an opposite end of said pressure bar, to continue actuation of said pressure bar.

2. In a book binding machine,
(a) a frame,
(b) a gang of punches guided on said frame for vertical movement with respect thereto,
(c) a pressure bar guided for vertical movement with respect to said punches,
(d) and actuating means moving said pressure bar angularly in a downward direction to first engage an end punch of said gang of punches and then successively engage the remainder of the punches of said gang of punches,
(e) comprising a rock shaft,
(f) means for rocking said rock shaft,
(g) two spaced actuators on said rock shaft adjacent opposite ends thereof,
(h) two spaced bushings extending transversely of said pressure bar in registry with said actuators,
(i) said actuators comprising actuator pins angularly offset with respect to each other and operable to successively engage within said bushings and first depress one end of said pressure bar and then depress the opposite end of said pressure bar upon continued depressible movement of said one end of said pressure bar.

3. A book binding machine of the class described, comprising
(a) a frame,
(b) a gang of punches on said frame guided for vertical movement with respect thereto,
(c) a pressure bar disposed above said punches and guided for movement toward and from said punches,
(d) set bars carried by said pressure bar for registry with said punches and arranged along a line inclined upwardly from one end of said pressure bar to the other, to effect successive operation of said punches,
(e) and means for first engaging one end of said pressure bar and then both ends thereof, for actuating said pressure bar to effect the successive operation of said punches.

4. A book binding machine of the class described, comprising
(a) a frame,
(b) a gang of punches on said frame guided for vertical movement with respect thereto,
(c) a pressure bar disposed above said punches and guided for movement toward and from said punches,
(d) set bars carried by said pressure bar for registry with said punches and arranged along a line inclined upwardly from one end of said pressure bar to the other, to effect successive operation of said punches,
(e) and means for actuating said pressure bar to effect the successive operation of said punches, comprising

a rock shaft, actuator pins extending radially therefrom, angularly offset with respect to each other and having successive inter-engagement with said pressure bar.

5. A book binding machine of the class described, comprising
(a) a frame,
(b) a gang of punches on said frame guided for vertical movement with respect thereto,
(c) a pressure bar disposed above said punches and guided for movement toward and from said punches,
(d) set bars carried by said pressure bar for registry with said punches,
(e) and means for actuating said pressure bar to effect the successive operation of said punches, comprising a rock shaft,
(f) actuator pins extending radially from said rock shaft and angularly offset with respect to each other and
(g) bushings extending transversely of said pressure bar, adjacent opposite ends thereof and successively engaged by said pins to first depress one end of said pressure bar and to then depress opposite ends thereof and angularly move said pressure bar to successively engage said punches to effect a punching operation.

6. A book binding machine of the class described, comprising
(a) a frame,
(b) a gang of punches on said frame guided for vertical movement with respect thereto,
(c) a pressure bar disposed above said punches and guided for movement toward and from said punches,
(d) set bars carried by said pressure bar for registry with said punches and arranged along a line inclined upwardly from one end of said pressure bar to the other, to effect successive operation of said punches,
(e) and means for actuating said pressure bar to effect the successive operation of said punches, comprising a rock shaft,
(f) actuator pins extending radially therefrom angularly offset with respect to each other and
(g) bushings extending transversely of said pressure bar, adjacent opposite ends thereof and successively engaged by said pins to first depress one end of said pressure bar and then depress opposite ends thereof and angularly move said pressure bar to successively engage said punches to effect a punching operation.

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