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Machine for binding books and punching paper.

An improvement on commercial machines which bind documents using plastic strips. The punch mechanism (37, 38, 39, 41, 42, 43) may be automatically actuated when the paper sheets are properly aligned on a punch platen (36) or actuated manually at the user's discretion. Distance of the holes from the edges of the sheets may be indexed. The binding mechanism improvements include interchangeability of height of the pressure bar (106) and speed of binding mechanism, depending on thickness of book to be bound or as selected by user, means (133) for automatically starting the motor drive (116, 117, 118) of the binding mechanism and pressure bar (106) when it has been manually placed or moved onto the document to be bound, automatic lifting of the pressure bar (106) when the binding cycle has been completed, a resistance-heated knife construction (161) which reaches operating temperature more rapidly, controls and minimizes the heated knife (163) temperature fluctuations, maintains a more uniform temperature profile of the knife, improvements in the mounting of the timing cams of the machine and improved means for securing and positioning the cooling and forming fingers in place. In a modification, means is provided for binding a "wrap-around" cover which extends rearward of the spine of the book and then is folded forward around the binding strips for the book. The means comprises a removable backstop (88a) for the spine edges of the sheets to be

bound, a platen (258) and roller (263) to support the lowermost of the wrap-around covers and a rack to support the uppermost of the wrap-around covers during the binding procedure. The knife structure (161a) is modified to avoid interference with the modified means.

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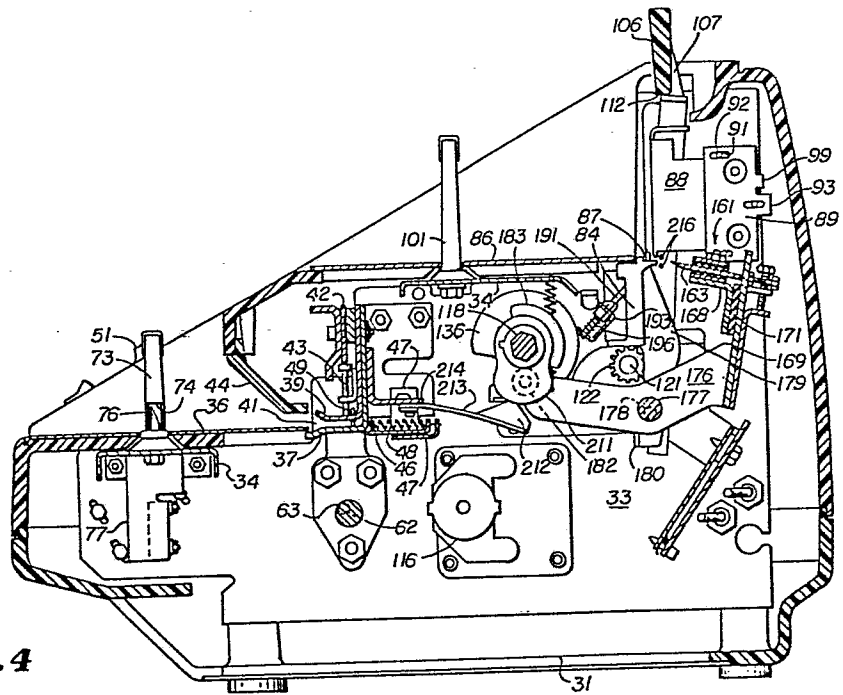


Fig. 4

MACHINE FOR BINDING BOOKS AND PUNCHING PAPER

1 This invention relates to a new and improved punching and
2 binding machine and comprises improvements on commercially avail-
3 able machines. Reference is made to U. S. Patent 4,079,647 on a
4 sheet punching apparatus; the punch mechanisms hereinafter de-
5 scribed are an improvement upon that structure. Reference is
6 also made to Patent 3,811,146 on machine for binding books, many
7 of the mechanisms of which are incorporated in the present inven-
8 tion. Generally, the invention relates to a system for binding
9 together, either temporarily or permanently, pluralities of
10 sheets of paper, each formed with a series of spaced apertures
11 adjacent one margin thereof using a first strip having studs
12 which correspond in spacing to the apertures in the sheets and
13 a second strip formed with holes aligned with the holes in the
14 sheets to receive the studs. The present machine, as well as
15 the predecessor machines, incorporate a pressure bar which applies
16 pressure on the sheets of paper while pressing the strips toward
17 each other, a knife, preferably heated, which cuts off the excess
18 lengths of the studs and forms heads on the ends of the studs and,
19 again preferably, means for cooling and setting the heads resem-
20 bling rivet heads on the studs. Such machines have proven
21 commercially successful.

22 In the machine hereinafter described there are both punching
23 and binding functions, it being understood that these functions
24 could be performed by separate machines having the features here-
25 inafter emphasized. With respect to the punching mechanism,
26 many of the elements thereof are disclosed in Patent 4,079,647.
27 One of the improvements of the present invention is that, instead
28 of manual actuation of the punch, an electric motor is used to
29 actuate the same. An automatic punch starting mechanism is
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1 electively employed. Thus, two switches or sensors are posi-
2 tioned with their actuators in the throat of the punch and
3 located on opposite ends of the punch. Thus, when the paper to
4 be punched is fully inserted in the throat of the machine assur-
5 ing that the edge of the paper is parallel to the punch pins in
6 the punch mechanism, both switches or sensors are closed. Still
7 a third switch or sensor is located on a side edge guide for the
8 machine and is closed when the paper is properly aligned with the
9 edge guide which positions the opposite edge of the paper in re-
10 lation to the pins in the punch. When all three switches or
11 sensors are closed, the punch cycle is initiated. The edge guide
12 switch is of particular construction hereinafter described in
13 detail for the purpose of preventing damage to it and for insur-
14 ing that the paper is flat on the platen of the punch before the
15 edge guide switch is closed.

16 A further feature of the punch mechanism resides in the
17 selective positioning of the punch backstop so as to punch the
18 holes at different desired distances from the spine edge of the
19 paper. For ordinary documents, the edges of the holes are spaced
20 inward one-sixteenth of an inch from the spine margin, and these
21 spacings are used with binding strips which are one-quarter inch
22 in width. However, for certain purposes, typically binding com-
23 puter print-out sheets, wider strips are used and the holes are
24 spaced inward a slightly greater distance. Control of the dis-
25 tance from the spine is determined by a backstop in the throat of
26 the punch. The present invention discloses mechanism under con-
27 trol of the operator for moving the backstop toward and away from
28 the front of the machine to selectively control the location of
29 the holes punched.

1 With respect to the binder mechanism, the present invention
2 comprises improvements over Patent 3,811,146.

3 Certain of the improvements relate to the pressure bar and
4 its actuation. The pressure bar is a device which is slideably
5 mounted in the machine and for much of its path of travel has a
6 vertical direction. The pressure bar is manually moved from a
7 position of rest into its vertical direction of movement and low-
8 ered or dropped until it contacts the uppermost of the plastic
9 strips; and thereafter, by mechanical means, a predetermined
10 pressure is applied against the uppermost strip thus compressing
11 the sheets of paper, thereby controlling the ultimate tightness
12 of the bound document.

13 One of the features of the present invention relates to the
14 vertical height positioning of the pressure bar. The length of
15 the studs of the first plastic strip commercially available varies
16 upon the customer's needs - i.e., the maximum thickness of books
17 to be bound. Further, the thickness of the sheets is another
18 variable. The present invention provides means for positionally
19 sensing the height of the pressure bar and the mounting therefor
20 to accommodate different desired maximum thicknesses of books to
21 be bound.

22 Another feature of the pressure bar mechanism is means for
23 controlling the speed of the binding cycle of the machine, it
24 being understood that it is desirable to bind sheets of paper more
25 slowly for thicker books. The operator is provided with a selec-
26 tor switch for fast or slow movement of the binding mechanism or
27 binding cycle time, but there is a further automatic override
28 which prevents the operator from selecting the faster speed where
29 a lower speed would produce a plastic rivet head configuration
30 resulting in an improved bound document strength.
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1 Still another feature of the invention is the provision of
2 a switch which will automatically start the motor which drives
3 the binding mechanism when the pressure bar has been lowered to
4 a position where its lower edge is in contact with the uppermost
5 strip.

6 A still further feature of the invention is the provision
7 of a mechanism which automatically raises the pressure bar to
8 its initial position of rest at the end of the binding cycle,
9 thereby eliminating the necessity of the operator raising the
10 pressure bar.

11 Another feature of the invention relates to the knife struc-
12 ture. In accordance with the present invention, the knife is
13 resistance heated. A sandwich construction of a metal knife and
14 on either side thereof resistance heating and insulation layer is
15 disclosed and is preferred; a single heating layer being satis-
16 factory but slower. Such a construction insures rapid heating of
17 the blades of the knife to operating temperature, uniform heating
18 of all of the knife blades distributed across the width of the
19 machine or a uniform temperature profile derived by the design of
20 the heating element pattern that compensates for irregular heat
21 losses, and minimizes temperature fluctuations utilizing electron-
22 ic circuitry and sensing and feedback circuitry of the temperature
23 directly from the knife blade.

24 A further feature of the invention is an improved cam and
25 cam-mounting system. A hexagonal or other regular or irregular
26 cross-section camshaft other than round is employed, the shaft
27 being mounted in bearings in the side frames of the machine. The
28 cams are distributed along the length of the camshaft at proper
29 locations and secured in position by snap rings or other means.
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1 When it is necessary to replace a cam, instead of disassembling
2 the entire machine as was required in previous models, the snap
3 rings for all of the cams and for the retainers on the ends of
4 the shaft are removed and the shaft is withdrawn from the machine.
5 A defective cam is replaced, and all of the cams are then re-
6 assembled and locked into position. Considerable time is saved
7 in initial manufacture and particularly in maintenance in the
8 field. Indicators are formed on the cams so that the cam pro-
9 files are properly aligned relative to the faces of the hexagonal
10 shaft.

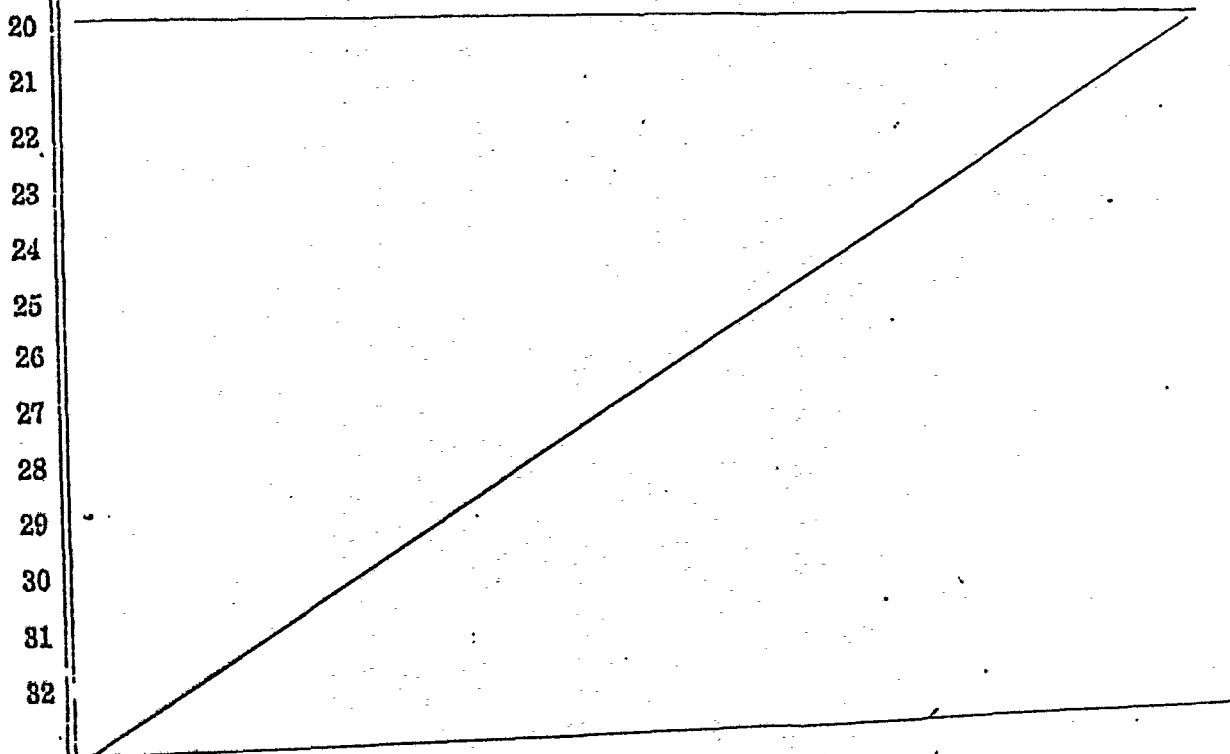
11 Still another feature of the invention is the provision of
12 improved means for locking, guiding and positioning the fingers,
13 which cool and set the formed heads on the severed ends of the
14 plastic studs, which increases their shear strength, into a slid-
15 ing channel which supports and guides the fingers. Again, con-
16 siderable saving of time in initial installation of the fingers
17 and replacement of fingers in the field is achieved.

18 The foregoing portion of this specification has related to
19 a conventional book bound by Velo-Bind strips such as that shown
20 in the aforementioned prior patents. Another type of book to
21 which the present invention is applicable is the "wrap-around"
22 cover. In this modified book, at the time of binding, the front
23 and back covers extend rearwardly relative to the spine edges of
24 the pages to be bound. After the covers have been bound along
25 with the pages, the rearward extending portions are folded forward
26 around the binding strips and, preferably, caused to adhere to end
27 sheets of the pages which have been bound. To accept such covers,
28 the backstop which normally limits rearward movement of the sheets
29 to be bound is removable and is removed during fabrication of the
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1 wrap-around book. To support the lowermost cover rearward of
2 the spine edges of the paper, a platen is installed and a roller
3 is located to press the lowermost cover against the rear platen.
4 Similarly, a rack is suspended above the platen to support the
5 uppermost wrap-around cover.

6 It is, accordingly, a purpose of the present invention to
7 provide means whereby either a conventional Velo-Bind document
8 may be bound or the apparatus may be utilized to bind a book
9 having a wrap-around cover.

10 A further feature of the invention is a modification of the
11 knife structure used in fabricating the wrap-around cover. Knife
12 blades which cut off the excess stud lengths are bent at an obtuse
13 angle relative to the plate to which they are fastened, and the
14 plate is disposed at a downward-rearward slanted angle. Hence,
15 as the knife structure moves forwardly to cut off the excess stud
16 lengths and then moves upwardly to form rivet heads, all of the
17 knife structure is below the plane of the lowermost wrap-around
18 cover and hence does not damage the cover nor does the supporting
19 mechanism interfere with movement of the knife structure.



1 Other objects of the present invention will become apparent
2 upon reading the following specification and referring to the
3 accompanying drawings in which similar characters of reference
4 represent corresponding parts in each of the several views.

5 In the Drawings:

6 Fig. 1 is a top plan view of the apparatus with the upper
7 exterior casing and certain parts removed for clarity purposes.

8 Figs. 2, 3, 4 and 5 are sectional views taken substantially
9 along the lines 2--2, 3--3, 4--4 and 5--5, respectively of Fig. 1.

10 Fig. 6 is an enlarged view of a portion of Fig. 3 showing
11 the pressure bar return mechanism in various positions of its
12 cycle of operation.

13 Fig. 7 is a fragmentary perspective view showing a portion
14 of the bind backstop and associated mechanism where a short stack
15 of paper is to be bound.

16 Fig. 7A is a view similar to Fig. 7 showing a taller backstop.

17 Fig. 8 is a fragmentary sectional view taken substantially
18 along the line 8--8 of Fig. 7.

19 Fig. 9 is a fragmentary plan view showing the knife structure
20 in retracted position and the bridge.

21 Fig. 9A is a fragmentary plan view of a heater element for
22 the knife structure with portions broken away to reveal internal
23 construction.

24 Fig. 9B is a fragmentary side elevational view of a portion
25 of the structure of Fig. 9A.

26 Fig. 10 is an enlarged sectional view taken substantially
27 along the line 10--10 of Fig. 9.

28 Fig. 11 is an enlarged sectional view taken substantially
29 along the line 11--11 of Fig. 9.

30 Fig. 12 is a fragmentary enlarged sectional view taken sub-
31 stantially along the line 12--12 of Fig. 11.

1 Fig. 13 is a fragmentary sectional view taken substantially
2 along the line 13--13 of Fig. 9 showing a normal size binding
3 strip.

4 Fig. 14 is a view similar to Fig. 13 showing use of a wider
5 than standard size binding strip used when paper sheets contain
6 apertures farther distances from the edges.

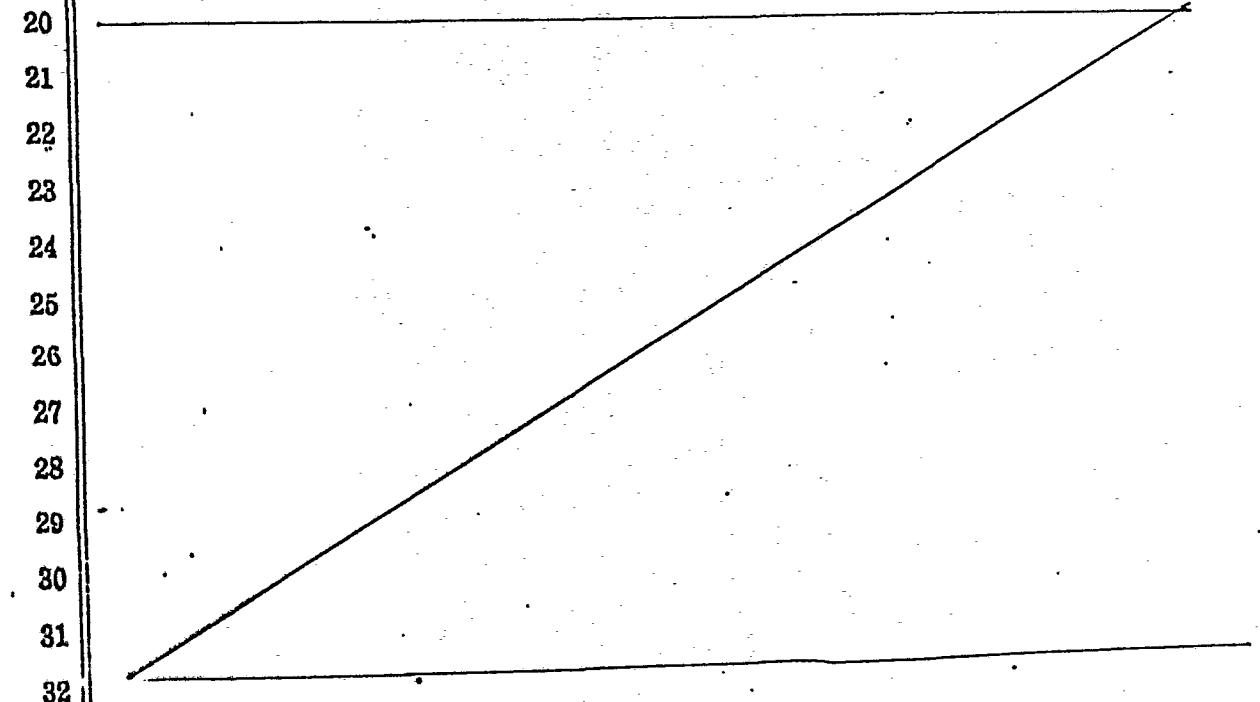
7 Fig. 15 is a view taken along line 15--15 of Fig. 1.

8 Fig. 16 is a schematic simplified wiring diagram of the
9 machine.

10 Fig. 17 is a fragmentary sectional view similar to a portion
11 of Fig. 4 showing modification of the structure for wrap-around
12 cover fabrication, the knife structure being in retracted
13 position.

14 Fig. 18 is a view similar to Fig. 17 showing the knife struc-
15 ture in forward and raised position and showing the wrap-around
16 cover support elements in a somewhat different position from
17 those shown in Fig. 17.

18 Fig. 19 is a fragmentary view of a cooling finger and its
19 environment.



General Description of Machine

As is set forth in prior Patent 3,811,146 among others, the present invention is intended to punch and bind paper 21 formed with spaced apertures 22 along one spine edge thereof. In accordance with the present invention, provision is made to locate the apertures 22 at either of two distances from the spine edge of the sheets of paper 21. If the sheets 21 are standard computer print-out sheets, the apertures 22 are spaced a greater distance from the spine edge of the paper than for ordinary or standard document binding. As appears in the discussion of the punching mechanism hereinafter set forth, provision is made for spacing the apertures at either of two distances.

In accordance with the present invention, a first strip 24 of plastic having studs 23 spaced at the same intervals as the apertures 22 is provided. The strips 24 may be of two widths depending upon the spacing of the apertures 22 from the edges of the sheets 21. There is also used in accordance with this system of binding a second strip 26 formed with holes 22 and counterbores or countersinks 28. Typical specifications for the material, sizes, etc., of the strips 24 and 26 are set forth in Patent 3,811,146.

The machine of the present invention comprises a base 31 on which fits an ornamental molded casing 32 which houses the mechanisms hereinafter described. Within the sides of the casing 32 are vertical side plates 33 which are the main supports for most of the mechanisms hereinafter set forth. The side plates 33 are interconnected by various transverse, horizontal cross members 34.

The machine heretofore described performs two functions. The first is to punch apertures 22 in the paper 21. The second is to bind the paper 21 between the strips 24, 26. In a preferred embodiment of the invention, both the punching and binding functions are located within the same casing 32, but it will be understood that the two functions of the machine may be installed in separate machines.

Punching Mechanism

Extending horizontally, transversely near the proximal end of the machine and at a relatively low elevation, is a punch platen 36 on which the papers 21 are supported and positioned relative to the punch throat 41. Behind the inner edge of the platen 36 is a die plate 37 formed with holes corresponding to the spacing of the apertures 22. Plate 37 is located immediately rearwardly of the rear edge of the platen 36 and is horizontally aligned therewith. Vertical member 38 is an integral portion of the punch mechanism which also functions as a transverse, horizontal cross member 34 and is fixed to the side plates 33, and this carries a punch guide plate 39 which extends horizontally forwardly and then slants upwardly forwardly providing an entrance chute and provides a throat 41 between the plate 39 and the die plate 37. Punch plate 42 is vertically reciprocal relative to member 38 as hereinafter explained. A plurality of pins 43 corresponding in number to the holes in the die plate 37 are retained in punch plate 42 as is described in Patent 4,079,647. Forwardly of plate 42 is a downwardly-rearwardly slanted paper deflector 44 which guides and deflects papers as they are inserted into the machine toward the throat 41. There is a vertical gap between the lower edge of plate 39 and plate 37 and horizontally reciprocal therein is a slide 46 which rests upon a slide support 47 fixed to side plates 33. Slide 46 is retained and guided by studs 29 fixed to die plate 37. Spring 48 biases the slide 46 rearwardly. Actuators 72 of switches 71 on slide 46 extend into throat 41 and trigger the electrical circuitry to actuate the punching mechanism when it is moved by the inward insertion of sheets 21. The stop means 49 is located on slide 46. By means hereinafter described, the slide 46 may be moved forwardly and rearwardly to control the spacing from the spine edge of the paper 21 to the apertures 22.

1 Extending through a suitable window in the casing 32
2 is a selector slide 51 which may be manually moved between two
3 positions. The slide 51 is connected to a flexible cable 52
4 which extends to a lever 53 which is pivoted to a pin 54 on die
5 plate 37. As the slide 51 is moved forward and rearwardly, the
6 cable 52 causes a pivoting of lever 53. A forward extension 56
7 of slide 46 has a down-turned forward terminus in which is
8 caught one of the arms of lever 53. Thus, the slide is moved
9 forwardly and rearwardly to control the spacing of the apertures
10 22 as hereinafter explained.

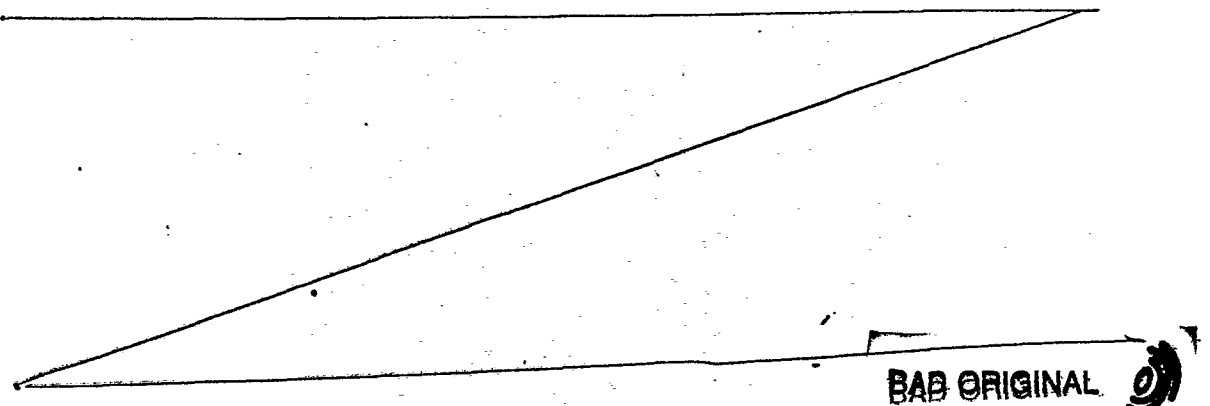
11 The punch may be manually actuated by depressing
12 control switch 238 or set by switch 237 to automatically trigger
13 electrical circuitry when actuator 72, of switch 71, is moved
14 by sheets of paper. The punch mechanism is motor driven by
15 punch motor 61 which has extended shafts 62 having eccentric
16 crank 63 on both ends. A vertical lever 64 has an aperture
17 in its end which receives the eccentric crank 63. At the upper
18 end of lever 64 is an elongated slot 66. An outward directed
19 ear 67 is formed in punch plate 42 and is received within slot
20 66. Hence, as the motor 61 turns, the eccentric crank 63 causes
21 the vertical lever 64 to reciprocate and thus to reciprocate
22 the punch plate 42 and the pins 43 which are aligned with the
23 holes in the die plate 37. Hence, paper in the throat 41 having
24 its spine edge against the stop 49 is properly punched. Member
25 50 retains lever 64 in position.

26 In one form of the invention, the punch motor 61 is
27 manually controlled by a switch. However, preferably, the punch
28 may be made to perform automatically.

29 Thus, slide 46 carries two switches 71 having forwardly
30 extending switch actuators 72 which extend into the throat 41 at
31 its rearward end. The positions of the switches 71 and actuators
32 72 is dependent upon the position of slide 46 under the control
33 of selector slide 51.

1 An edge guide is located on the left side of the machine
2 (although, of course, it might be located on the right side).
3 This guide 73 is vertically upstanding and may be moved inwardly
4 and outwardly relative to the center line of the machine to ad-
5 just for different lengths of sheets. The details of this adjust-
6 ment are not herein illustrated or described since they are old
7 in the art. The inward-facing edge of guide 73 is formed with an
8 opening 74. Within the opening 74 is a third switch actuator 76.
9 As shown in Fig. 4, actuator 76 is sloped downward at a 45° angle,
10 forming a sharp point, while also being twisted at a 45° angle on
11 its top edge. Thus, if paper is fed from the top, it will not
12 jam or hang up on the edge of actuator 76. The tip of the actua-
13 tor will be moved inside the opening 74. The actuator 76 is
14 twisted 45° so that if paper is inserted from the front, it will
15 not jam against the actuator but in both instances will move the
16 actuator inward to actuate switch 77. If both switches 71 and
17 switch 77 are closed, it is insured that the paper 21 is fully
18 inserted in the throat 41 against the stops 49 and that the edge
19 of the paper is located properly against the edge guide 73.
20 Closing of all three switches assures paper length is parallel to
21 pins 43 and perpendicular to other edges of paper and energizes
22 the motor 61 and causes reciprocation of the lever 64 and a punch-
23 ing cycle.

24 Preferably, there is a cycle cam 78 on an eccentric crank 63
25 on one side of the machine which controls switch 79 and turns off
26 the motor 61 after one cycle or one revolution of the motor shaft.



Binding Mechanism

As has previously been stated, the binding mechanism of the present machine resembles, in many respects, that of Patent No. 3,811,146, and where the elements of the present machine are substantially the same as those of the preceding machine, they are not herein described in detail.

Extending horizontally across the width of the machine and supported by cross-members 34 is a binding platen 86, having at its rearward edge a depression or recess 87, at the level of the top of transverse bridge 84 which is secured at opposite ends to the side-plates 33. This depression 87 is shaped to receive strip 26. Rearward of depression 87 is a stop 88 which limits inward movement of sheets 21 supported by platen 86. As has been stated, the present machine may be provided with parts which are interchangeable to accommodate different heights of stacks of paper, such as, for example, a two-inch maximum stack and a three-inch maximum stack. Therefore, the stop 88 is a changeable part for the machine.

Stop 88 has a rearward and outward extension 89 formed with horizontal slots 91. Pins 92 fit through the slots 91 and are anchored in side plates 33. An ear 93 on extension 89 extends behind the rear edge of plate 33 and receives a spring 94 which is connected at its opposite end to spring anchor 96 on the side of plate 33 opposite extension 89. The function of spring 94 is to bias the stop 88 forward so that pressure is applied to strip 26 when it is placed in depression 87 and so that the tabs 99 (an extension of 88) contact side plate 33 to limit its forward movement. This is the normal position of the stop 88. As is

1 described in the Punching Mechanism heretofore set forth, for
2 certain types of sheets, the apertures 22 are punched at a
3 greater distance from the spine edge of the sheets. When the
4 latter sheets are used, a wider strip 26 is used than normal.
5 Placing such a wider strip in the depression 87 forces the stop
6 88 rearwardly against the force of the springs 94. Hence, when
7 the sheets 21 are pushed rearwardly to contact the stop 88, the
8 holes therein are in proper relationship to the holes in the strip
9 26.

10 For purposes hereinafter described in detail, it will be
11 noted that there is formed a depression 98 on top surface of 88
12 to provide clearance for the switch plunger, so it will not acci-
13 dentally actuate the electrical circuitry to start the binding
14 cycle.

15 Edge guide 101 on platen 86 is transversely moveable to accom-
16 modate different widths of sheets 21.

17 The first step in the operation of the binding mechanism,
18 therefore, is to place a strip 26 of proper width, depending upon
19 the positioning of the apertures 22 for the sheets 21 with which
20 it is to be used, into the depression 87, thereby positioning
21 backstop 88 correctly. Locating pin 102 (see Fig. 11) fits into
22 a hole (not shown) in strip 26 to locate strip 26 laterally in
23 depression 87. A stack of sheets 21 is then placed on the platen
24 86 against the edge guide 101 and against stop 88, thereby align-
25 ing the apertures 22 with the holes 27 in strip 26. Second strip
26 24 is then installed by inserting studs 23 through apertures 22
27 and 27.
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Pressure Bar

A transverse horizontal, vertically moveable pressure bar 106 is provided. Again, to accommodate different maximum height stacks of sheets, the pressure bars 106 are interchangeable. Such interchangeability is preferably provided by using different brackets 107 which may be an integral part of pressure bar 106 and which are mounted to rack 110 on each side of the machine. A roller 108 fits into a slot 109 in side plate 33 and, at the top of the slot 109, there is a rearward offset 111. When the roller 108 is in the offset 111, the pressure bar 106 is held in upward position. However, when pressure bar 106 is lifted and moved forwardly so that the roller 108 slides down the slot 109, the bottom edge 112 of pressure bar 106 is brought into contact with the top of strip 24. Recessed into bottom edge 112 is a switch 133 which, when its actuator contacts strip 24, initiates the binding cycle of the machine. The function of depression 98 in the flange surface 97 is to prevent closing of switch 113 when the pressure bar 106 is in retracted position, with roller 108 in the offset 111.

Binding motor 116 is mounted on side plate 33 and, by means of a belt-drive 117, is connected to drive transverse horizontal hexagonal camshaft 118. Shaft 118 is supported between the plates 33 by bearings (not shown) and is held in place by snap ring retainers 119 at either edge.

Horizontal transverse floating shaft 121 carries pinions 122 which mesh with the teeth of the racks 110. Also on shaft 121 is ratchet wheel 123 which is engaged by pawl 124, biased into engagement with the ratchets 123 by springs 126. Pawl 124 is pivoted on pivot 127 to spring anchor 121. Shaft 121 is supported on

1 either side of the machine by spring anchors 131, pivoted on
2 pivots 132 which are mounted to the plates 33. On the forward
3 ends of spring anchors 131 are flat springs 133 which carry cam
4 followers 134 which are engaged by pressure cams 136 on shaft
5 118.

6 . As shaft 118 revolves, follower 134, which engages pressure
7 cam 136, is increasingly depressed, thus pulling rack 110 down-
8 ward and causing pressure bar 106 to be forced against strip 24
9 until a predetermined pressure is reached, whereupon spring 133
10 flexes, and despite continued turning of cam 136, no greater
11 pressure is applied to the strip 24.

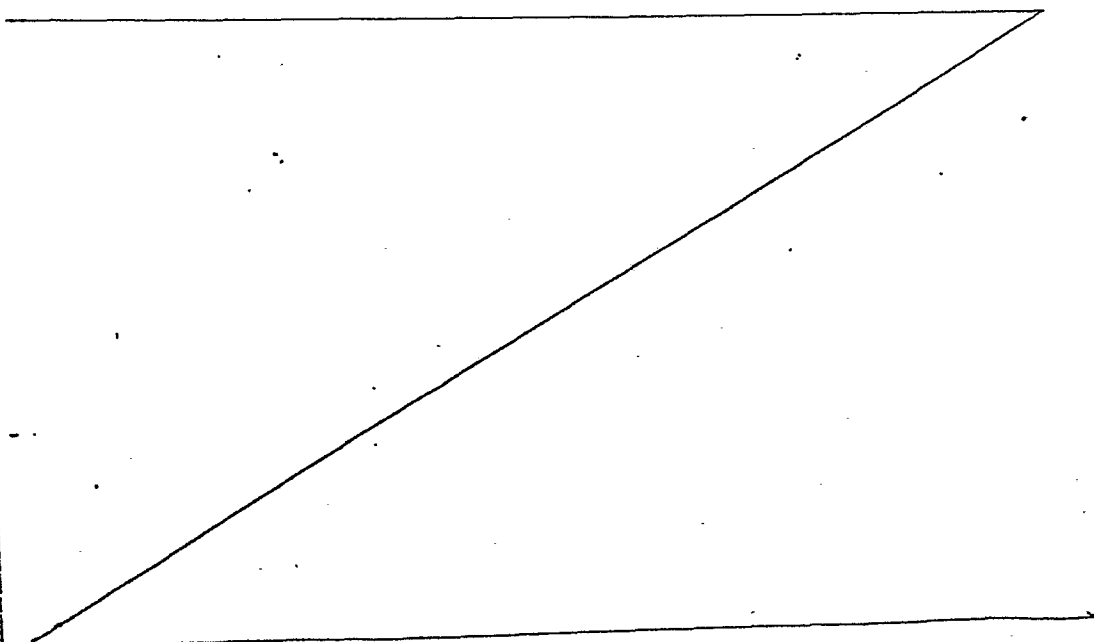
12 To prevent unacceptable variations in acoustical noise levels
13 caused by applying varying loads to the D.C. bind motor 116 as
14 each cam performs its function as they rotate through the binding
15 cycle, there is provided on shaft 118 a counter-pressure cam 211
16 which assures uniform loading onto motor 116. Cam follower 212
17 is mounted on spring 213 and fastened by attachment 214 to one of
18 the cross-members 34. The follower 212 exerts a pressure on the
19 cam 211 which counter-balances the forces imposed on the system
20 by the binding mechanisms.

21 One novel feature of the present invention is the provision
22 of means which automatically returns the pressure bar 106 to
23 upper position. Return arm 141 is angular and is pivoted at
24 pivot 142 to side plate 33. On its forward end there is a gear
25 segment 143 consisting of approximately two teeth. Fixed for
26 movement with shaft 118 is a meshing gear segment crank 144,
27 also having approximately two teeth. Adjustably positioned on
28 the lower end of return arm 141 is a roller 146. The rest posi-
29 tion of arm 141 is determined by stop 147. Pivoted to plate 33
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1 is a first pressure bar link 148 which is pivoted to second
2 pressure bar link 149 by pivot 151. The upper end of link 149
3 is connected to the pressure bar by the same means as connects
4 roller 108. There is a stop 152 fixed on plate 33 which limits
5 clockwise movement of link 149 as viewed in Fig. 3.

6 As the binding cycle is completed, rotation of shaft 118
7 causes the driver gear segment 144 to mesh with gear segment 143,
8 and this causes counter-clockwise rotation of return arm 141
9 about pivot 142. Roller 146 engages link 148 and oscillates it
10 around the shaft of gear segment 143, and this causes link 149
11 to raise the pressure bar to upper position and drop the roller
12 108 into offset 111, causing pressure bar 106 to remain at rest
13 position until the operator initiates the next binding cycle of
14 the machine. Meanwhile, continued rotation of shaft 118 brings
15 the gear segments 143 and 144 out of mesh with each other. Where-
16 upon, return arm 141 drops to initial position with its lower end
17 resting on stop 147.

18 Carried on shaft 118 is a cam 153 which engages the actuator
19 of switch 154 after the gear segments 143 and 144 have ceased to
20 mesh. Switch 154 stops the rotation of bind motor 116.



Cut-Off

After the sheets 21 have been clamped between the strips 24, 26, continued turning of shaft 118 causes cutting of the excess lengths of the studs 23 projecting below the bottom strip 26. Mounted behind the depression 87 is a knife structure 161. Structure 161 comprises a cutter 162 having blades 163 projecting forwardly and spaced about the same distance as the studs 23. Above and below cutter 162 are heating elements 164 which are resistance heating sandwiches which are elevated in temperature when current flows therethrough. Heater element 164 is composed of several layers sandwiched together. The central conductor is cut from a sheet approximately 0.007 inches thick metal such as "Inconel". The pattern is composed of right angle bent, structures, as best shown in Fig. 9A, consisting of ends 155 parallel to the length of cutter 162 interconnected by longitudinal stretches 156 transverse thereto. To make provision for the bolts which bolt knife structure 161 together, holes 158 are formed in the heater element 164 and there are extended sections 157 to accommodate the space for the holes 158. On the top and bottom of the members 155-157 are sheets of asbestos cloth 159. On the outsides of the sheets 159 are sheets of mica 172 of a thickness of about 0.015 inches. As shown in Fig. 9B, on the side of the heater elements 155-157 closest to cutter 162 there is but one sheet 172 whereas on the opposite side there are several sheets 172. On each end of element 164 there is an outward extension 173 of nickle bonded to the outermost stretch 156. Extension 173 is surrounded by a glass fiber sleeve 174 which surrounds also the end of the conductor 175 and the connector between the conductor and element 173.

In a preferred heater element 164, at either end the widths of 155 and 156 are less than they are at the center. Thus at the end shown in Fig. 9A the stretches 156 are approximately

1 0.052 inches in width and the spacing between these widths is
2 about 0.042 inches. At the center, however, the width of the
3 member 156 is 0.054 inches whereas the spacing between the
4 members 156 remains 0.042. The width change, although slight
5 in dimension, alters the electrical resistance of the metal and
6 consequently the heat or watt density. Hence more heat is
7 generated at the ends of the sandwich but there is more heat
8 loss at the ends. Thus there is a balancing which creates a
9 uniform temperature across the entire length of the knife blades
10 163.

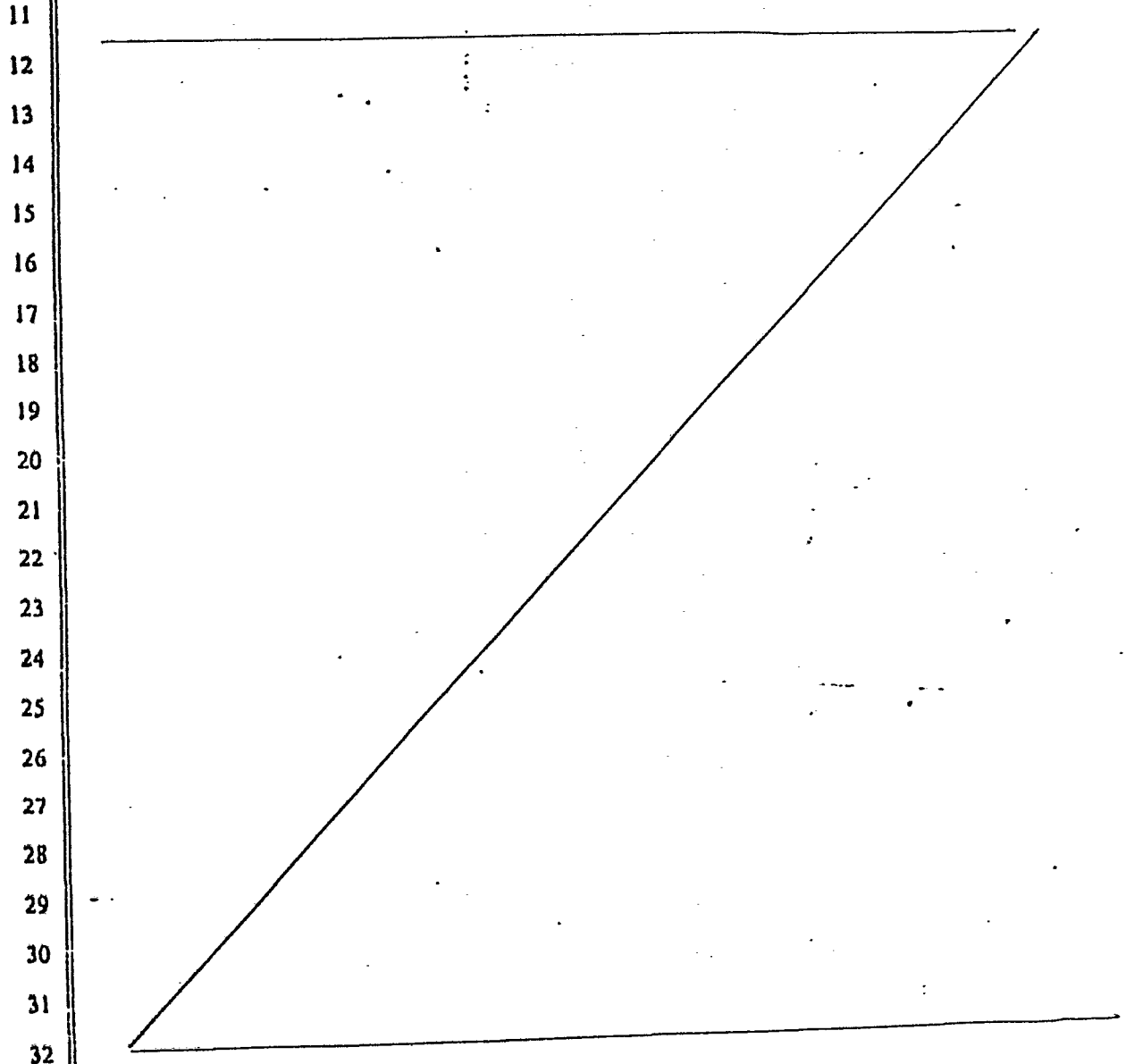
11 The cutter 162 temperature is sensed by means of a
12 thermistor 165 that is inserted within the cutter and is retained
13 under tension by spring wire 160. Above and below each heating
14 element 164 is an insulator 166, and on top of top insulator 166
15 is a cover 167. Below the lower insulator 166 is a support bar
16 168 to which is attached a support bracket 169 insulated there-
17 from by a high temperature insulator 171. Each support bracket
18 169 is connected to pivot arm 176 which is pivoted about trans-
19 verse horizontal eccentric shaft 177. The outer ends 178 of shaft
20 177 are received in brackets 179, dependent from bridge 84 and
21 held in place by keeper plate 180. On the forward ends of pivot
22 arm 176 are cam followers 182 which engage cutter cams 183 on
23 camshaft 118. The cams 183 cause the knife support bar 168 to
24 move about shaft 177 as a center and cut off the excess lengths
25 of the studs 23.

26 To prevent build-up of plastic particles on the blade 163, a
27 pair of vertically-spaced apart, transversely-extending wiper-
28 wires 216 is mounted on holders 217 affixed to bridge 84. The
29 blades 163 reciprocate between the wires 216, and the latter wipe
30 off any accumulation of plastic particles. The wipers 216 are
31 supported and tensioned by coil springs on either end. The
32 wipers are of flexible plastic tubes with non-sticking surface

1 characteristics loosely encasing wires 216. This enables a
2 relative rotating motion of the tubes with the wires that assures
3 a more positive wiping and cleaning action.

4
5 Head Forming

6 Extending forwardly from shaft 177 is lift arm 186
7 carrying at its forward end follower 187 which engages lift
8 cams 188 on shaft 118. The function of cam 188 is to cause
9 the support bar 168 to be raised to deform the heated ends of
10 the severed studs 23 and initiate the forming of heads thereon.



1 Cooling fingers 191 correspond in spacing transversely
2 of the machine to studs 23. Each finger 191 has a first non-
3 circular cross-section lower end 202, a circular cross-section
4 portion 205 above portion 202, a second non-circular cross-section
5 portion 192 above portion 205, a reduced diameter circular section
6 203 above portion 202 and an enlarged cross-section upper portion
7 204 above portion 203. The surface at the upper end 205 is angu-
8 lar to the center line of finger 191.

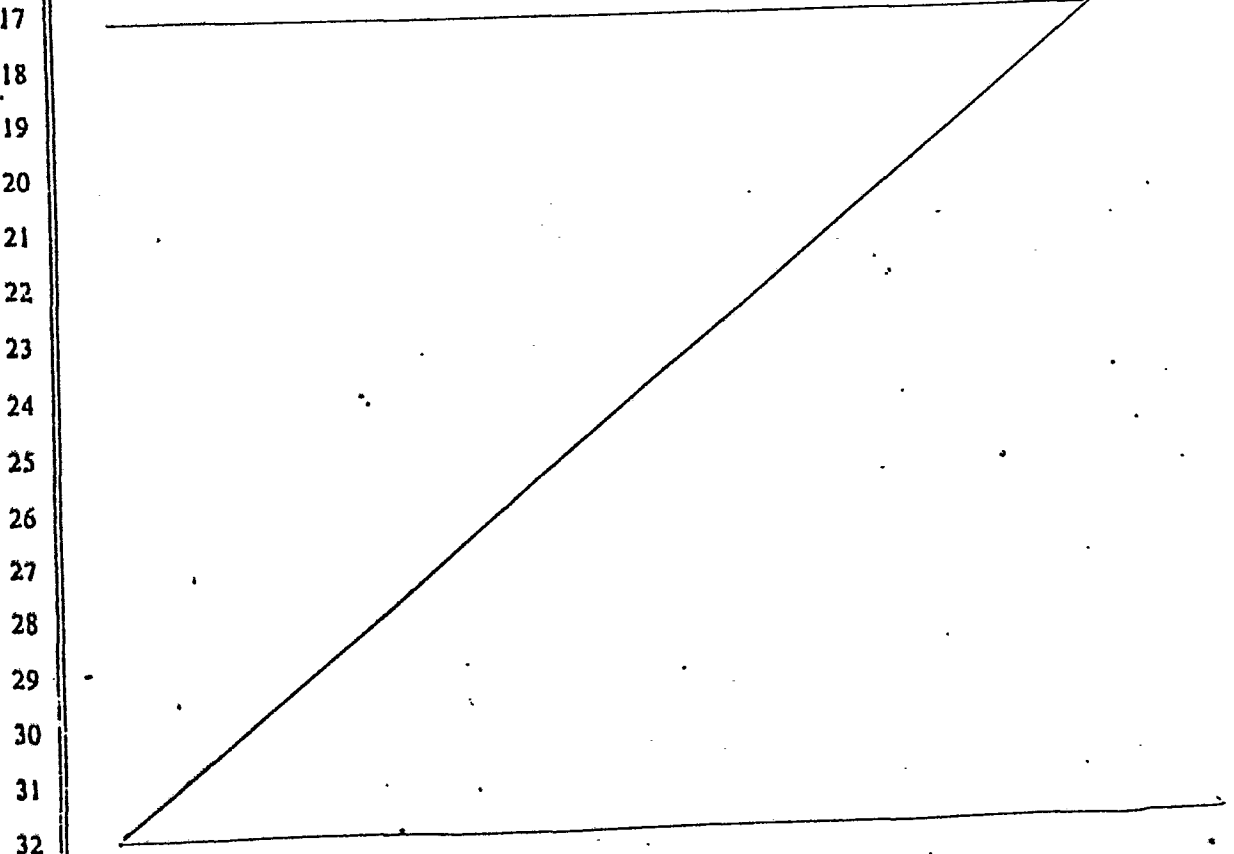
9 Channel 193 reciprocates upwardly-rearwardly from the
10 retracted position of Fig. 11 to a raised position with angular
11 surface at the upper end 205 immediately below recess 87 in
12 bridge 84 which is suitably apertured for passage first of blades
13 163 and then of fingers 191. The lower flange 221 of channel
14 193 is formed with first non-circular holes 223 complementary
15 to ends 202. The upper flange 222 is formed with second holes
16 194 complementary to second portion 192. Springs 196 between
17 flanges 221 and 222 surround fingers 191.

18 By inserting end 202 first through hole 194, then
19 through spring 196 and then through hole 224 (as section 192 fits
20 through hole 194) until section 203 is even with second hole
21 194 and then twisting finger 191 through 90°, lower end 202
22 locks behind flange 221. Spring 196 bears against section 192
23 and biases finger 191 upwardly-rearwardly. If finger 191
24 encounters resistance, spring 196 flexes so that finger 191
25 yields with a reciprocating sliding motion, rather than the
26 finger remaining immobile and breaking. Spring 196 restores
27 finger 191 to projected position when resistance to movement
28 has been removed.

29 Extending forwardly from each end of channel 193 is
30 bracket 197 which carries on its forward end cam followers 198
31 which engage cooling cams 199 on camshaft 118. As the cam 199
32 rotates, after the cutter blades 163 have been raised and

1 lowered by reason of the shape of cams 188, the channel 193 is
2 raised, causing the angular surface at the upper ends 205 of
3 cooling fingers 191 to engage and set the heads at the ends of
4 the studs and cool the same so that the strips are locked together
5 a fixed distance apart. Bifurcations 201 extending downward
6 from bracket 197 straddle and slip into grooves in shaft 118 to
7 maintain the positioning of fingers 191 within slots in bridge 84.

8 The individual cams 136, 153, 183, 188, 199, 211 are
9 formed with hexagonal holes through their hubs to receive shaft
10 118 and are located laterally by suitably-placed E-clips 120
11 fitting in grooves in shaft 118. By removing end clips 119
12 and the clips 120, the shaft 118 may be pulled axially outwardly,
13 the cams dropping off. To facilitate proper replacement, each
14 cam hub 136, 153, 183, 188, 199, 211 has either a projection
15 or depression 215 and these are aligned as the shaft 118 is
16 inserted, insuring proper cam positioning of their profiles.



Operation

At the commencement of operation, the operator pushes the main switch 236 which is located on one of the control panels on the sides of the machine. Although prepunched paper or paper punched by another machine may be used in connection with the binding portion of the machine, it will be assumed, for the purpose of this specification, that it is desired to punch appropriate holes 22 in sheets 21. One determination of the operator is the spacing of the apertures 22 from the spine edge of paper 21, depending upon whether regular paper or computer printout paper, etc., is being used. This selection is made by means of selector slide 51 on the control panel, as has heretofore been described, and this moves the slide 46 and the switch-actuator 72 inward and outward to determine how far into the throat 41 the spine edges of papers 21 may be inserted.

Another decision to be made by the operator is whether punching is to be done automatically or under manual control. This selection is made by means of the punch-mode switch 237 on the control panel. Assuming that a manual mode has been selected, the operator then inserts the sheets into the throat 41 resting on the platen 36 and preferably against the edge guide 73. Thereupon, the operator pushes the punch manual switch 238, and this energizes the punch motor 61 which reciprocates the punch-plate 42 so that the pins 43 punch the holes in the paper 21. At the end of one cycle, the cam 78 actuates the switch 79 which de-energizes motor 61.

Assuming that the punch operation will be automatic, punch-mode switch 237 is properly set for such operation. The selector slide 51 is positioned for the proper desired distance of the

1 apertures from the spine edge of the paper. The sheets 21 are
2 then laid on the platen 36 and inserted into the throat 41 and
3 against the edge guide 73. When both switches 71 and switch 77
4 are closed by reason of proper positioning of paper 21, the motor
5 61 is energized, and the punching cycle is performed, continuing
6 until the cam 78 opens switch 79 and turns off motor 61.

7 The first binding choice of the operator involves the bind-
8 mode switch 241 which is for standard or rapid speed of binding.
9 It is not desirable to use the rapid mode when the paper stack is
10 high. Hence, paper height switches 243 are located with their
11 actuators extending into the path of the pressure bar rollers 108.
12 Unless the pressure bar has been lowered sufficiently so that the
13 rollers 108 clear the actuators for switches 243, the machine
14 overrides the operator's selection of the bind-mode as per switch
15 241.

16 The operator inserts a proper strip 26 into the depression
17 87, depending upon the spacing of the apertures 22 from the spine
18 edge of the sheets 21. If the wider strip 26 is selected, the
19 stop 88 is pushed rearward; if the narrower strips 26 are select-
20 ed, spring 94 pulls the stop 88 forward. In any event, the spine
21 edge of the paper 21 is pushed against the stop 88 and also
22 against the edge guide 101. It will be observed from the fore-
23 going discussion that different heights of stacks of paper may
24 be accommodated. For example, the stop 88 may be at a height to
25 accommodate either two-inch or three-inch stacks of paper. This
26 selection is made at the factory or by a field serviceman and is
27 not ordinarily performed by the operator. It is assumed that an
28 appropriate stop 88 and also an appropriate pressure bar bracket
29 107 have been selected and these are coordinated.

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1 The operator observes the ready light 242, also on the con-
2 trol panel which turns on when the heaters 164 have sufficiently
3 heated the cutter 162, as determined by a thermistor 165. Prior
4 to the cutter 162 being heated, "wait light" 244 signals the
5 operator that the binding cycle is not operable.

6 Sheets 21 are placed on the platen 86 and pushed against the
7 stop 88 and edge guide 101. The studs 23 of strip 24 are then
8 inserted in holes 22 and 27 and strip 24 is pushed down. The
9 operator then grips pressure bar 106 and pulls it forwardly out
10 of the offset 111 and then downwardly so that the roller 108 rides
11 in the slot 109. When the bottom edge 112 of pressure bar 106
12 contacts the male strip, switch 113 is closed, and this energizes
13 the bind motor 116 which continues to cycle the camshaft 118
14 through one cycle.

15 The cycle of operation of the binding function of the
16 machine has been heretofore described in detail in connection with
17 the description of the various components thereof and is not here
18 repeated. Completion of the cycle of revolution of the camshaft
19 118 returns the pressure bar to upper and retracted position
20 through the operation of the elements 141-152.

21 Cam 153 actuates switch 154 to de-energize the bind motor 116
22 at the completion of the sequence of operations.

23 Referring to Fig. 16, the essential electrical components.
24 of the machine are illustrated schematically and in simplified
25 form. For practical purposes the following are representative
26 values of components illustrated:
27
28
29
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31
32

1	R 1	2.5 K (max.)
2	2, 6	1 K
3	3	1.5 K
4	4	10 K
5		
6	C 2	100 Micro f. (125 V)
7	5	10 " (200 V)
8	6	10 " (25 V)
9	7	10 " (50 V)
10		
11	Q 2	Triac
12		
13	CR 1	Bridge network
14	7, 8	IN 4004
15		
16	K	Switching relays
17		
18	RT 1	Thermistor - 1 milliamp at 1 M ohm
19		
20	A 1	CA 3059
21		

Strips 164 - comparable to:

Cat. No. ST 1018 of Hotwatt, Inc., Danvers, Mass.

Cat. No. HF-1514 of Ogden, Inc., Arlington Heights, Ill.

Cat. No. S-1405 of Chromalox, Inc., Pittsburgh, Pa.

Where the term "switch" is used herein, it will be understood that various sensors may be substituted.

Modification

The preceding modification has as its principal purpose the fabrication of a conventional VELO-BIND strip-bound document. Fig. 17 shows modification of the apparatus to accommodate a "wrap-around" cover type book. As shown in Fig. 18, sheets 21a are provided front and back with end leaves 281 which project rearwardly beyond the binding strips 24a, 26a, and are joined to front and rear covers 282. After the book is fabricated and removed from the binding machine, the covers 282 are folded forwardly, the connecting portions 283 which are rearward of the strips 24a, 26a, overlying the strips. If adhesive is applied to the end leaves 281, the insides of the covers 282 adhere thereto in the manner of conventional hard-bound books. Pressure sensitive end leaves, such as those shown in U. S. Patent 3,749,423 may be used as the end leaves 281. Alternatively, instead of hard covers 282, soft covers such as those made of plastic, paper, or other materials integral with the end leaves 281 may be employed.

Modifications of the previously described apparatus may be substituted. Directing attention first to the knife structure 161a, the angular support bar 168a is connected to pivot arm 176a in the manner shown in Fig. 17. Blades 163a are disposed at an angle relative to cutter 162a. As the blades 163a move from the retracted position shown in Fig. 17 to the projected and raised position shown in Fig. 18, the cutter structure 161a is at all times below the plane of the lower strip 26a and thus does not contact or damage the lower cover 282.

1 An additional modification of the structure is that the
2 paper stop 88a is removable. Stop 88a is formed with an elongated
3 vertical section 251, an upper horizontal rearward extending
4 section 252 and a downward rear vertical section 253.
5 Attached to each of the side plates 33a is a stop bracket 254
6 which has a vertical slot 256 into which rear section 253 slides
7 and against the top of which the horizontal section 252 rests.
8 For production of the books which have been described in connection
9 with the previous modification, the stop 88a is located in
10 place as shown in Fig. 17. However, to make the wrap-around
11 cover modification, the stop 88a is removed by sliding upward
12 so that section 253 slides out of the slot 256. To facilitate
13 removal, the pressure bar 106a may be moved forwardly from its
14 start or rest position.

15 A third modification of the machine is the installation of
16 a horizontal rear platen 258 behind bridge 84a and co-planar with
17 the platen 86a. Bracket 259 attached to side plates 33a supports
18 rear platen 258. Rearward and an integral part of platen 258 is
19 a formed right angle flange 261. Spring 262 attached to flange
20 261 and bracket 259 biases the platen 258 which is being pulled
21 by the spring forwardly of the machine. Hence, when an oversized
22 strip 26a is installed, the spring 262 flexes to permit
23 the platen 258 to move rearwardly a sufficient distance to accommodate
24 such wider strip.

25 The rear of bracket 259 has a vertical downward slot 264
26 into which the shaft of roller 263 slips. Roller 263 rides on
27 the top of lower cover 282 and holds it down.
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1 Still a third bracket 266 is attached adjacent the rear of
2 the machine and above the level of bracket 259. Bracket 266 is
3 formed with a slot 267 on its top edge dividing the upper end 266
4 into bifurcations 268. Screw 269 straddles slot 267.

5 Rack 271 is formed of wire or other suitable material for
6 the upper cover 282. Rack 271 has forward-outward directed ends
7 272 which fit into slots 267. Friction holds rack 271 in any
8 angle of adjustment, such as the horizontal adjustment shown in
9 Fig. 17 or the downward-rearward slanted adjustment shown in Fig.
10 18. The selected angle of rack 271 depends upon the thickness of
11 the book to be bound. Sides 273 parallel to plates 33a are inter-
12 connected by cross bars 274 intermediate sides 273 and at the
13 rearward end thereof. As best shown in Fig. 18, the lower edge
14 of upper cover 282 rests on one or the other of the cross bars
15 274.

16 In use of the device, the paper stop 88a is removed by lift-
17 ing same until rear portions 253 clear slot 256. A proper lower
18 strip 26a is inserted in the recess 87a and positioned by pin
19 102a fitting into a hole in the strip 26a, as well understood in
20 the art. The forward edge of rear platen 258 is biased by spring
21 262 against the rearward edge of the strip 26a. If strips wider
22 than those shown in Fig. 18 are required, the platen 258 moves a
23 corresponding distance rearward, stressing the spring 262.

24 Although it may be more convenient to preassemble the elements
25 of the book before installing it in the machine, the individual
26 elements may be assembled on the machine. First, the cover 282
27 is pushed rearwardly, resting on the rear platen 258 and under the
28 roller 263 and thus being held horizontal as shown in Fig. 18.
29 The end leaf portions 281 rest on platen 86a, and the holes (not
30 shown) in end leaf 281 are aligned with the holes (not shown) in
31 strip 26a. The sheets 21a are then placed on top of the lower
32

1 end leaf 281, the holes therein again being aligned with the
2 holes in strip 26a or end leaf 281. Thereupon, the top cover is
3 installed with the top cover 282 resting upon one of the cross
4 bars 274 of the rack 271 and the forward end leaf 281 resting on
5 top of the sheets 21a. Again, the holes in the top end leaf 281
6 are aligned with the holes in the sheets 21a. The studs (not
7 shown) of top strip 24a are then passed through the holes in the
8 top end leaf 281, the sheets 21a, the lower end leaf 281, and the
9 lower strip 26a.

10 The machine is then energized through one cycle of rotation
11 of the shaft 118a as in the preceding modification. As shown in
12 Figs. 17 and 18, the knife structure 161a pivots about shaft 177a
13 from the retracted position of Fig. 17 to the forward and then to
14 the forward-elevated position of Fig. 18, cutting off the excess
15 lengths of the studs and softening the stub end and forming heads
16 on the stub ends. Cooling fingers 191a then engage the softened
17 heads on the stub ends to cool and set the rivet heads, all as
18 explained in connection with the preceding modification.

19 The book is then removed from the machine and the covers 282
20 folded forwardly, the connecting portions 283 wrapping around the
21 strips 24a and 26a, and the covers 282 may be caused to adhere to
22 the end leaves 281 as previously explained or such step may be
23 omitted.

24 If it is desired to use the machine in fabricating books
25 which do not have the wrap-around feature, the backstop 88a may
26 be reinstalled to the position of Fig. 17. When the backstop 88a
27 is in place, rear platen 258 exerts forward pressure against ver-
28 tical section 251, which exerts pressure on strip 26a.

29 Many of the elements of the apparatus shown in Figs. 17 and
30 18 are similar in function to those in the preceding modification,
31 and the same reference numerals followed by the subscript a are
32 used to designate corresponding parts.

1. Apparatus for binding apertured sheets together using a first strip, a plurality of thermoplastic studs projecting from and spaced longitudinally along said first strip and a second strip formed with holes spaced longitudinally of said second strip at intervals complementary to said studs, said apparatus being of the type having a frame having a pair of spaced sides and a platen to support said sheets with their apertures aligned with said holes with said first strip above said sheets with said studs extending through said apertures and said holes and protruding below said second strip, a pressure bar, cooperating means on said sides and bar for guiding movement of said bar from a first position above said platen to a second position adjacent said platen and resting on top of said first strip, actuating means for moving said pressure bar, and a motor driving said actuating means characterized by a switch mounted on the bottom edge of said pressure bar positioned to be closed when said pressure bar rests on said first strip, said switch being wired when closed to energize said motor.

2. Apparatus for binding apertured sheets together using a first strip, a plurality of thermoplastic studs projecting from and spaced longitudinally along said first strip and a second strip formed with holes spaced longitudinally of said second strip at intervals

complementary to said studs, said apparatus being of the type having a frame having a pair of spaced sides and a platen to support said sheets with their aperture aligned with said holes with said first strip above said sheets with said studs extending through said apertures and said holes and protruding below said second strip, a pressure bar, cooperating means on said sides and bar for guiding movement of said bar from a first position above said platen to a second position adjacent said platen and resting on top of said first strip, actuating means for moving said pressure bar having a shaft transverse to said machine and a motor driving said actuating means characterized by first means on said shaft, a linkage on said frame, said linkage including second means connected to said pressure bar, third means to engage said first means, said first means being mounted to engage said third means after said shaft has been turned, said third means being arranged to lift said pressure bar to first position.

3. Apparatus as claimed in Claim 2 further characterised by a switch mounted on the bottom edge of said pressure bar positioned to be closed when said pressure bar rests on said first strip, said switch being wired when closed to energise said motor.

4. Apparatus according to claim 2 or claim 3 further characterized by said first means comprising a first segmental gear fixed to said shaft and said third means comprising a crank oscillatable on said frame, a second segmental gear fixed to said crank and engaging and being oscillatable by said first gear for only a short arc of the rotation of said first gear, said linkage including fourth means pivoted to said frame; said crank having means to engage said fourth means when said second gear is turned to pivot said fourth means and thereby lift said second means and lift said pressure bar to first position.

5. Apparatus according to any preceding claim further characterized by said platen having a depression at its rear edge shaped to receive said second strip, a vertical backstop at the rear of said depression, mounting means mounting said backstop on said frame for horizontal movement relative to said frame, means biasing said backstop for forward movement, whereby when a second strip is placed in said depression said backstop is pushed rearwardly a distance dependent upon the width of said second strip and said backstop restrains rearward movement of said sheets supported by said platen so that the apertures in said sheets are aligned with said holes in said second strip.

6. Apparatus according to claim 5 further characterized by said backstop being removable from said mounting means for replacement with a backstop of different height to accommodate different thicknesses of stacks of sheets.

7. Apparatus according to claim 6 further characterized by said actuating means for said pressure bar comprising a vertically reciprocating member adjacent said frame, a bracket connecting said pressure bar to said reciprocating member, said bracket being replaceable with a bracket of different length, the difference in length corresponding to the differences in height of said back stops.

8. Apparatus according to claim 6 or claim 7 further characterized by an electric circuit for said motor having means to drive said motor at fast or slow speeds and a manual switch in said circuit selective to drive said motor at either of said speeds.

9'. Apparatus according to claim 8 further characterized by a second switch on said frame having an actuator adjacent the path of movement of said pressure bar, said second switch being closed when said pressure bar is more than a predetermined distance above said platen, said second switch being wired into said circuit to drive said motor at slow speed when said second switch is closed regardless of the position of said manual switch.

10. Apparatus according to any one of claim 1 to 5 further characterized by said motor being of variable speeds and having manually selective means for varying the speed of said motor at least between a slow speed and a fast speed, sensor means for sensing the height of said sheets on said platen, and an electric circuit including said manually selective means, said motor and said sensor means to override said manually selective means to drive said motor at slow speed when the height of said sheets exceeds a predetermined height.

11. Apparatus according to any preceding claim further characterized by a cutter bar having a plurality of knife blades positioned to cut off portions of said studs protruding below said second strip, means to move said blades from a first position remote from said studs to a second position whereby said blades cut off said portions of said studs, heating means for said cutter bar, said heating means comprising a resistance heated strip between first and second heat insulators on one side of said cutter bar to form a sandwich, a third heat insulator above said sandwich, a cover above said third heat insulator, a fourth heat insulator below said cutter bar, said support being below said fourth heat insulator, means securing said cover, said cutter bar, said sandwich, said third and fourth heat insulators and said support together, temperature sensing means sensing the temperature of said cutter bar, and an electric circuit including said sandwich and said temperature sensing means to maintain said blades at a pre-selected temperature.

12. Apparatus according to any preceding claim which further comprises a punch mounted on said frame having a throat, a punch platen aligned with said throat to support sheets to be punched to form apertures, punch means, means for reciprocating said punch means, further characterized by a slide having a stop limiting inward movement of said sheets into said throat, mounting means mounting said slide on said frame for movement relative to said throat, and selector means for moving said slide to determine the location of apertures punched in said sheets relative to the leading edges of said sheets.

13. Apparatus according to claim 12 further characterized by said selective means comprising a lever pivoted relative to said mounting means, means interconnecting said slide and said lever, and manually actuated means for pivoting said lever.

14. Apparatus according to claim 12 or claim 13 which further comprises a second motor for said punch means, at least one switch on said slide, said switch being closed only when the leading edges of said sheets are fully inserted in said throat against said stop, said switch when closed energizing said motor.

15. Apparatus according to any one of claims 12 to 14 which further comprises an edge guide mounted for transverse movement on said punch platen engaged by side edges of said sheets on said punch platen, a switch closed only when said side edges of said sheets abut said edge guide, a second motor for said punch means, said switch when closed energizing said motor.

16. An apparatus according to any preceding claim of the type having a backstop mounted on said frame at the rear of and perpendicular to said platen, resilient means biasing said backstop substantially horizontally towards said platen, whereby second strips of different widths may be positioned on said platen, said backstop flexing rearward to accommodate the width of said second strips and which further comprises guide means on said frame guiding movement of said backstop whereby said backstop is at all times perpendicular to said platen and said backstop is removable from said frame, further characterized by a rear platen on said frame behind said first-mentioned platen to support a first wrap-around cover and a rack on said frame to support a second wrap-around cover at a higher elevation than said first wrap-around cover.

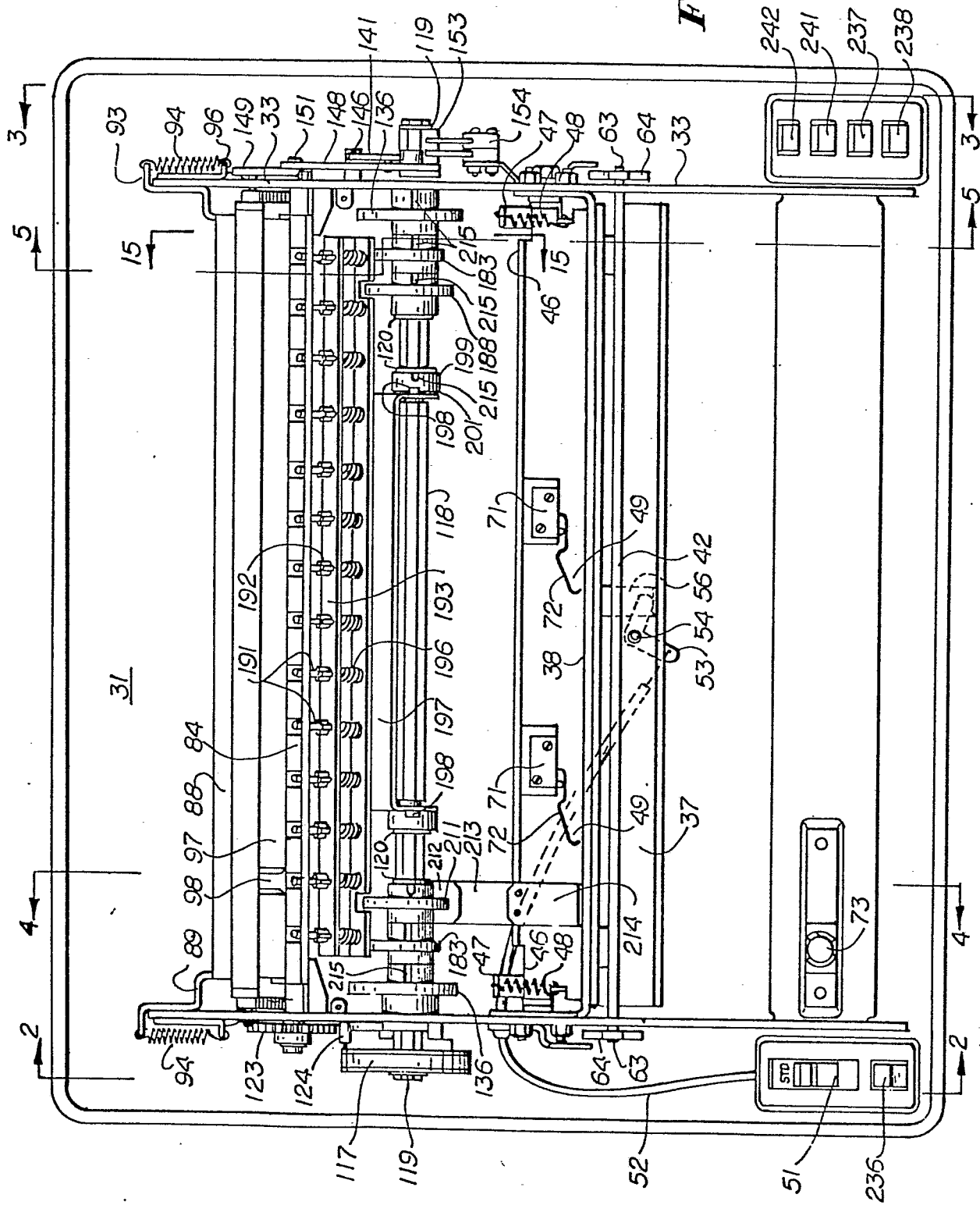
17. Apparatus according to claim 16 further characterized by stud cutting means having a cutter bar having blades mounted in said frame to move to cut off said studs in which said cutter bar slants downward-rearward and said blades extend forward of said cutter bar at an obtuse angle, whereby said cutter bar and said blades are always below the planes of said platens.



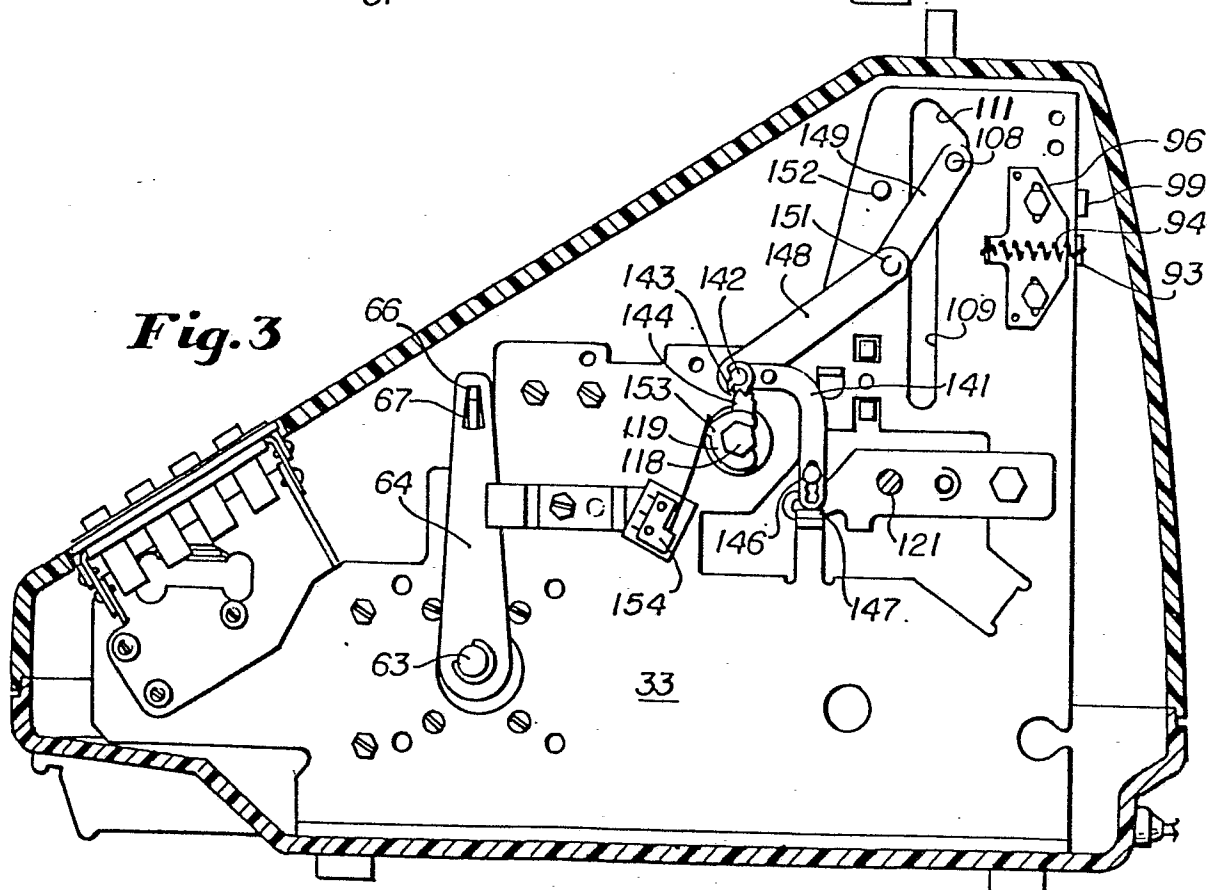
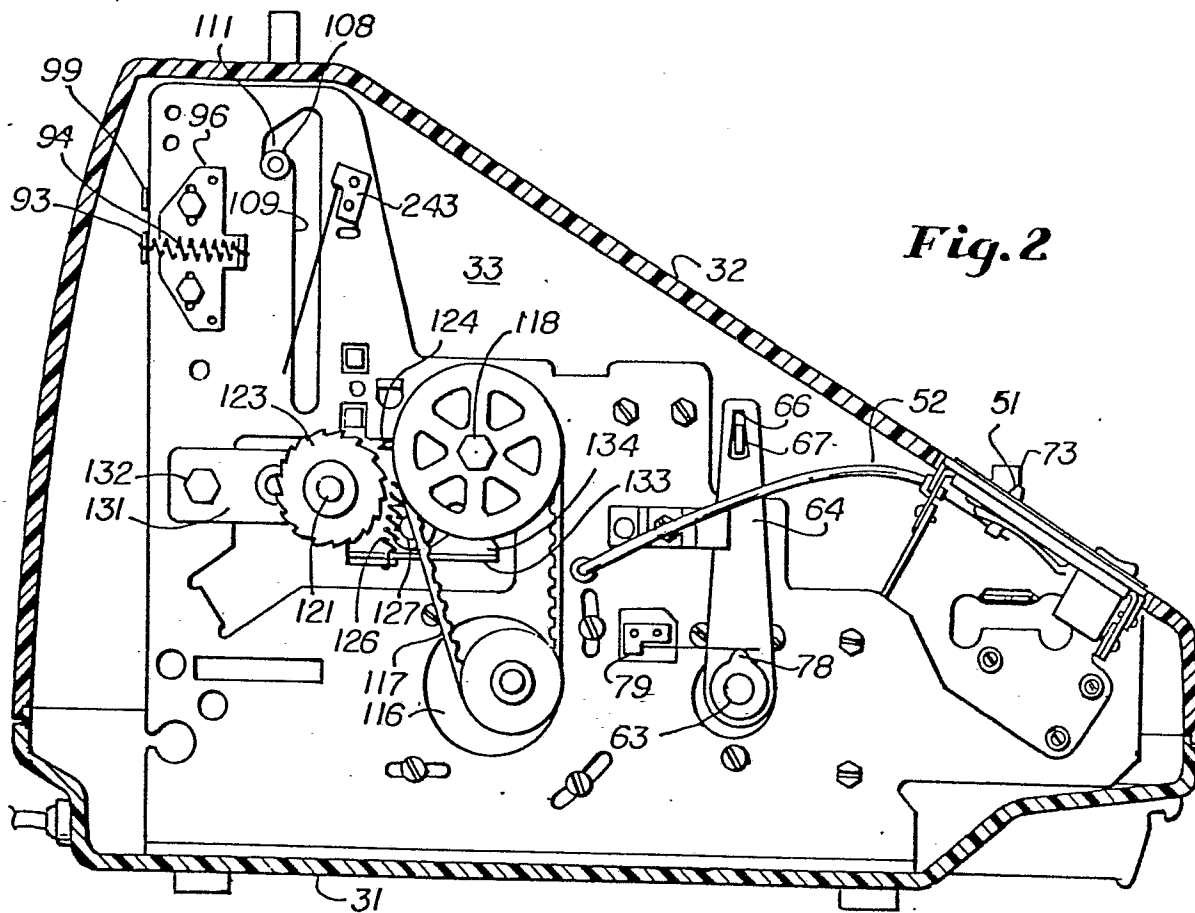
18. An apparatus according to any preceding claim further characterized by a transverse, slanted channel, means for moving said channel from an inoperative position upwardly-rearwardly to an operative position, said channel formed with first non-circular holes in its lower flange and with second non-circular holes in its upper flange, a plurality of fingers detachably held in said channel, each said finger having a first non-circular cross-section at a first end of said finger complementary to said first hole, each said finger having a first non-circular portion at a first end dimensioned to fit through said first hole when in one position and to lock behind said lower flange when said finger is turned approximately 90° , a first round portion above said first non-circular portion and dimensioned to turn in said first hole, a second non-circular portion above said first round portion dimensioned to slide in said second hole and when in said second hole to restrain rotation of said finger, a second round portion above said second non-circular portion dimensioned to turn in said hole and an operative portion above said second round portion and a spring surrounding part of each said finger, said spring bearing against said second flange and said second non-circular portion whereby said finger is inserted in said holes and twisted 90° said finger is captured in said channel, said spring permitting said finger to yield when encountering resistance and restore said finger to projected position when resistance to movement terminates.

1/8

Fig. 1



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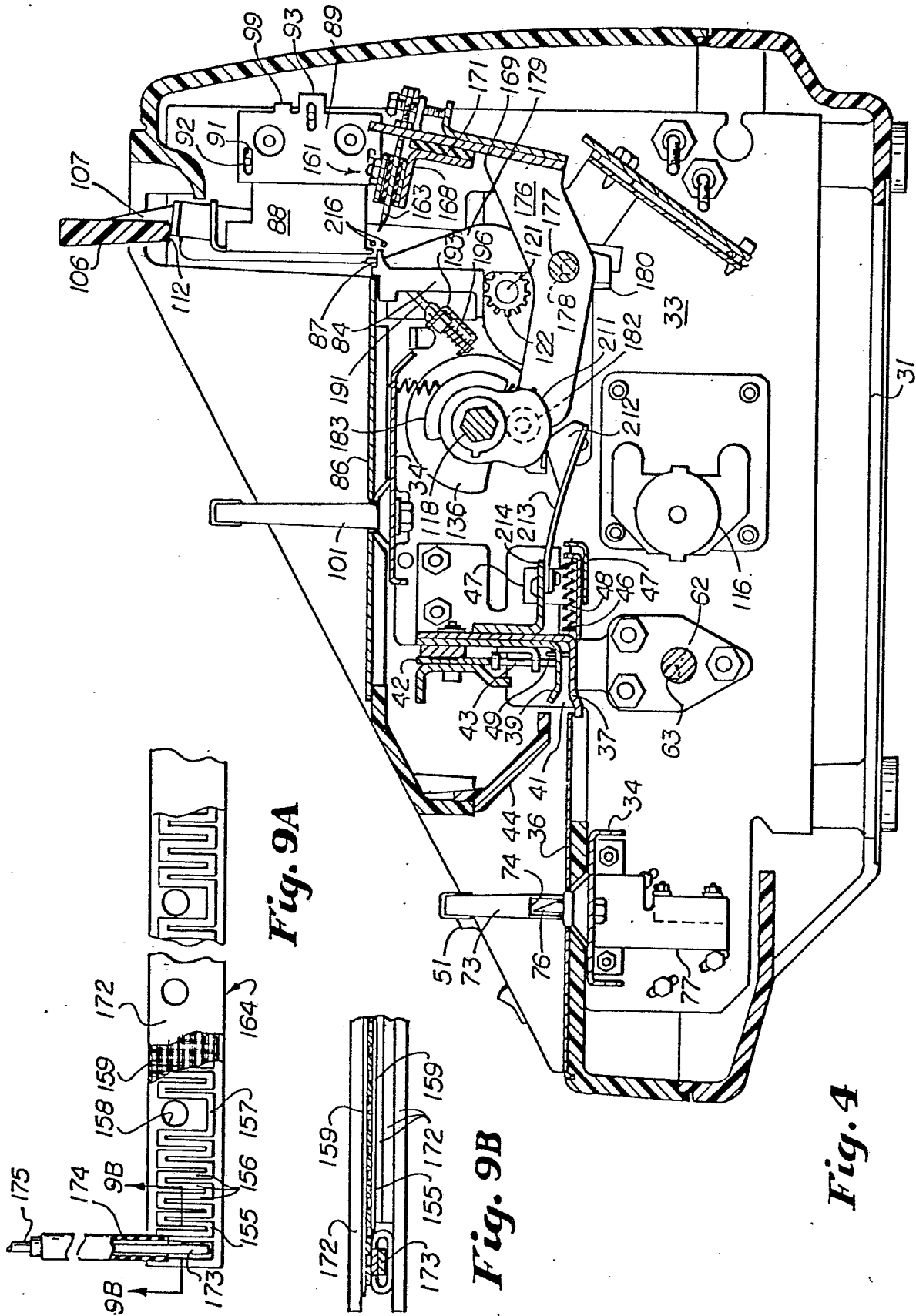
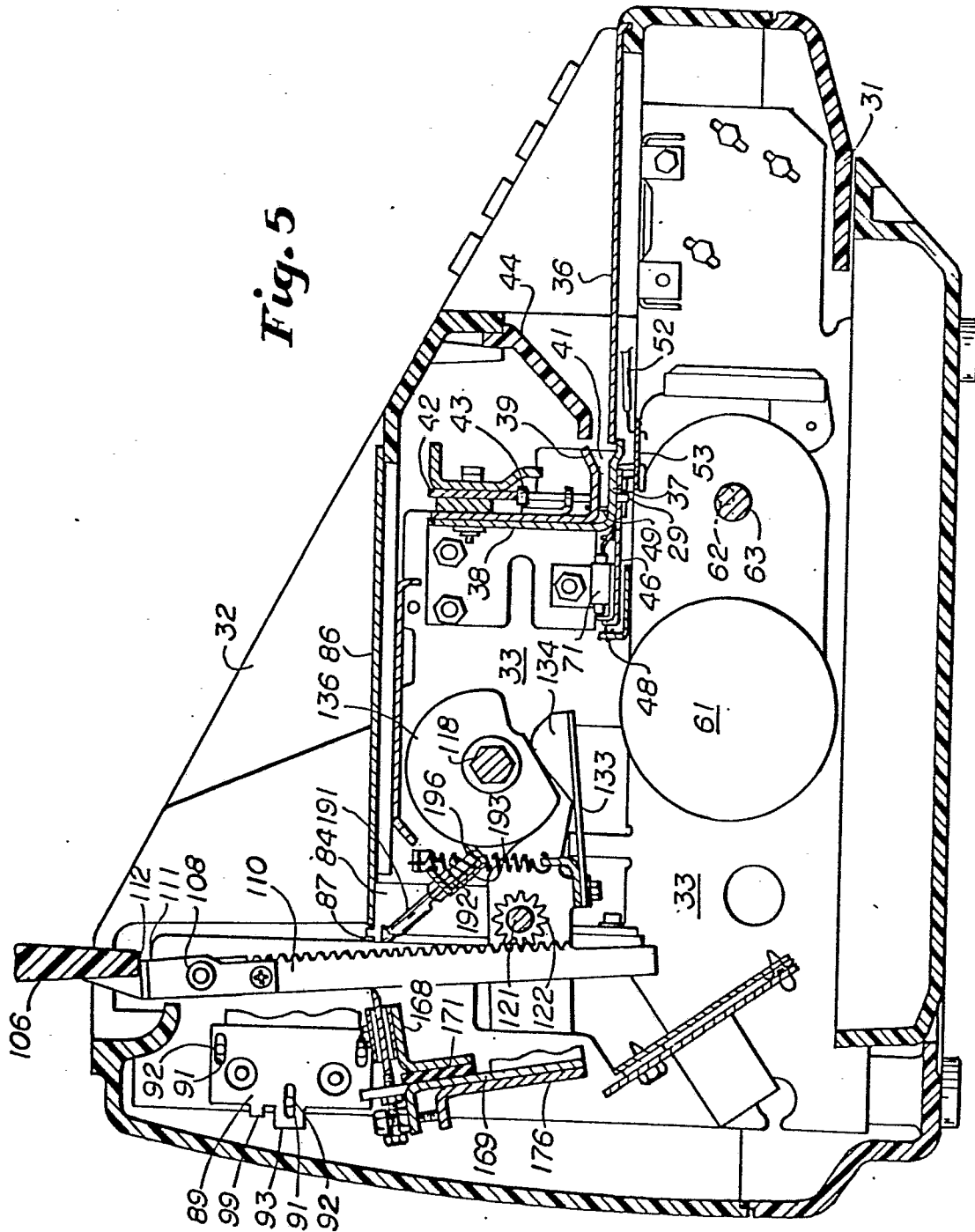
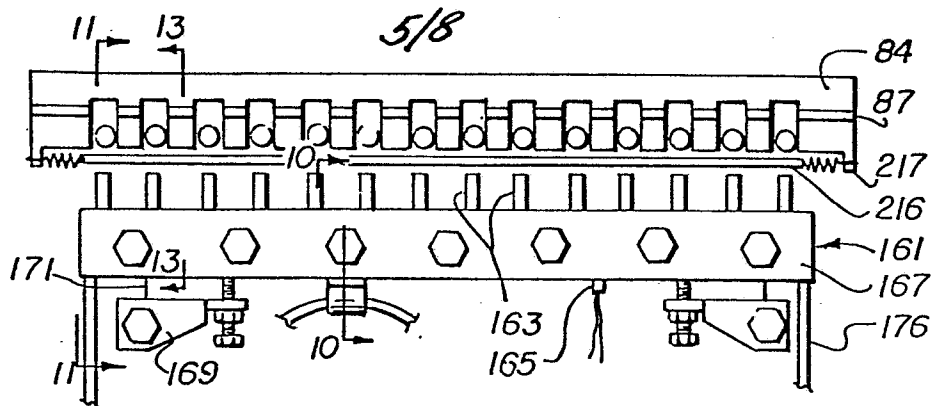
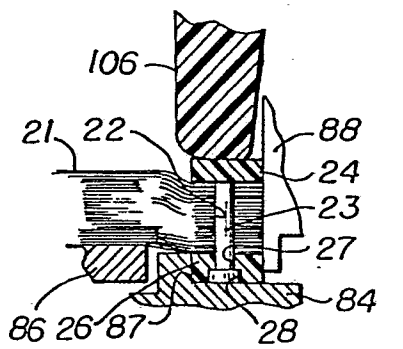
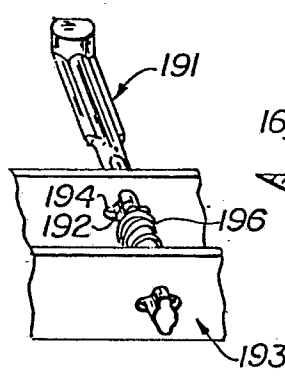
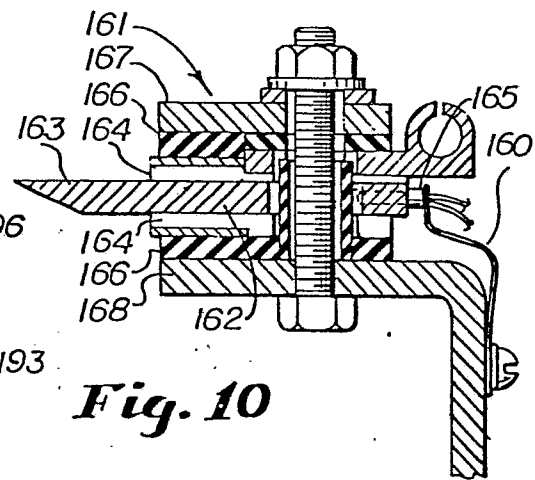
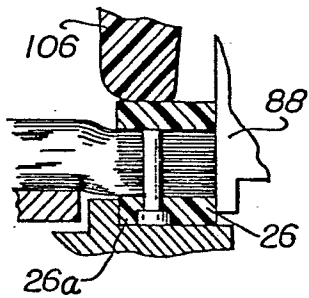
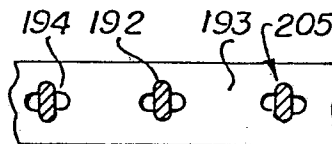
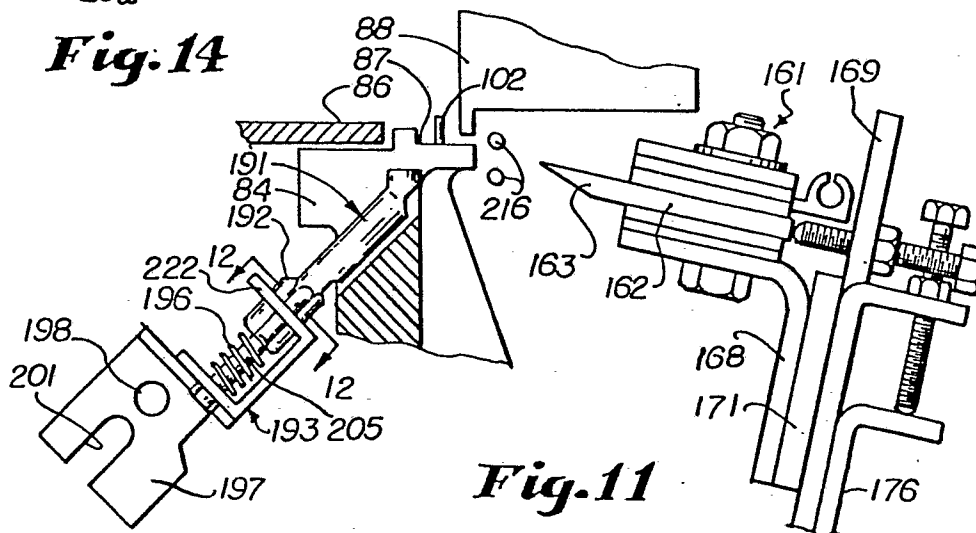
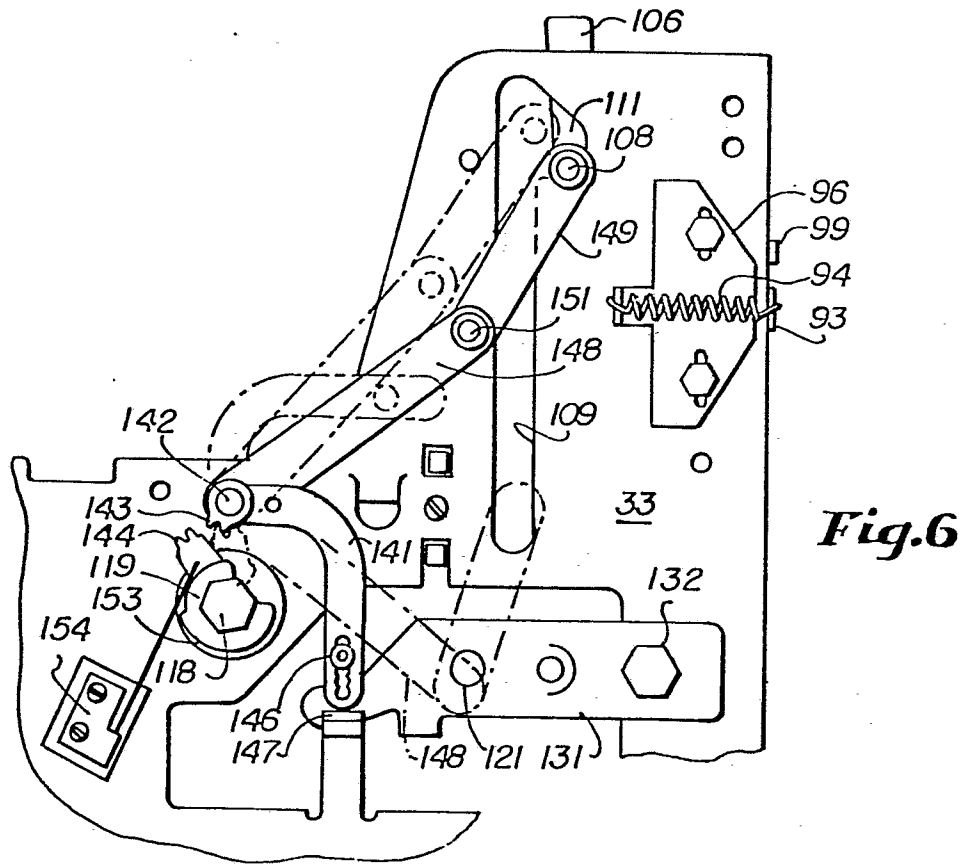
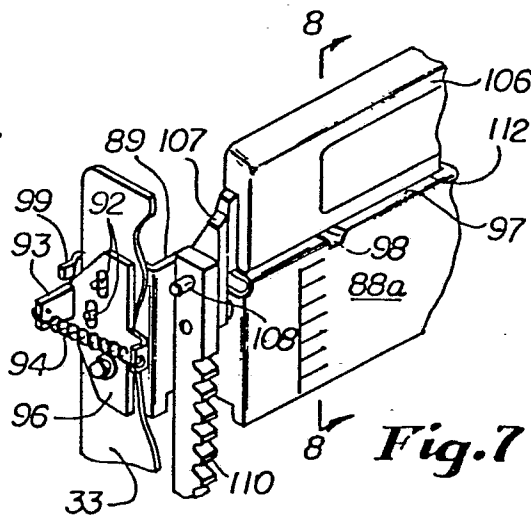
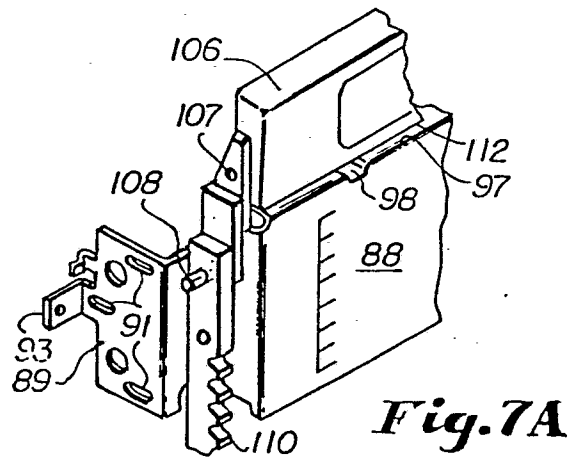
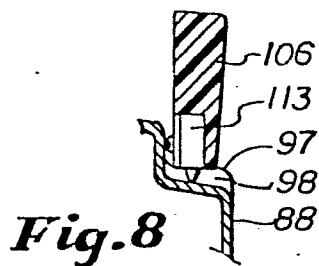
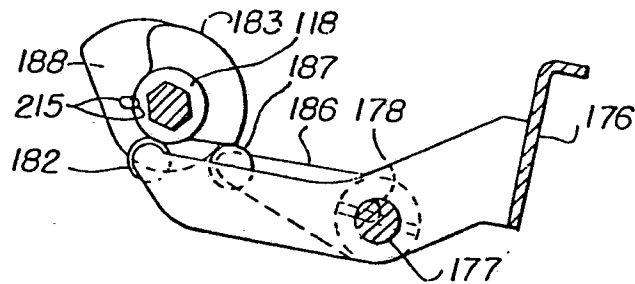


Fig. 5



**Fig. 9****Fig. 13****Fig. 19****Fig. 10****Fig. 14****Fig. 12****Fig. 11**

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**Fig. 6****Fig. 7****Fig. 7A****Fig. 8****Fig. 15**

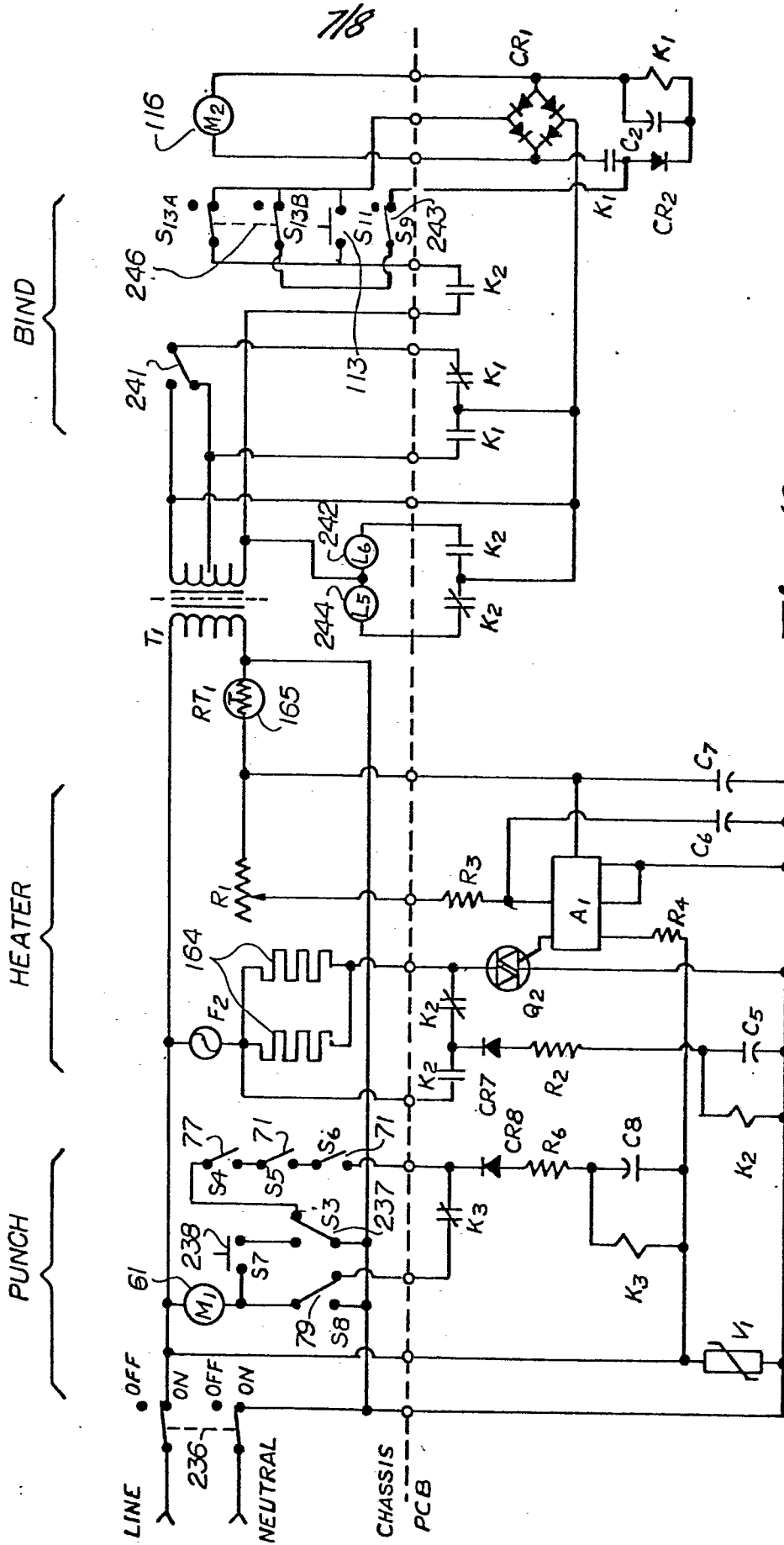
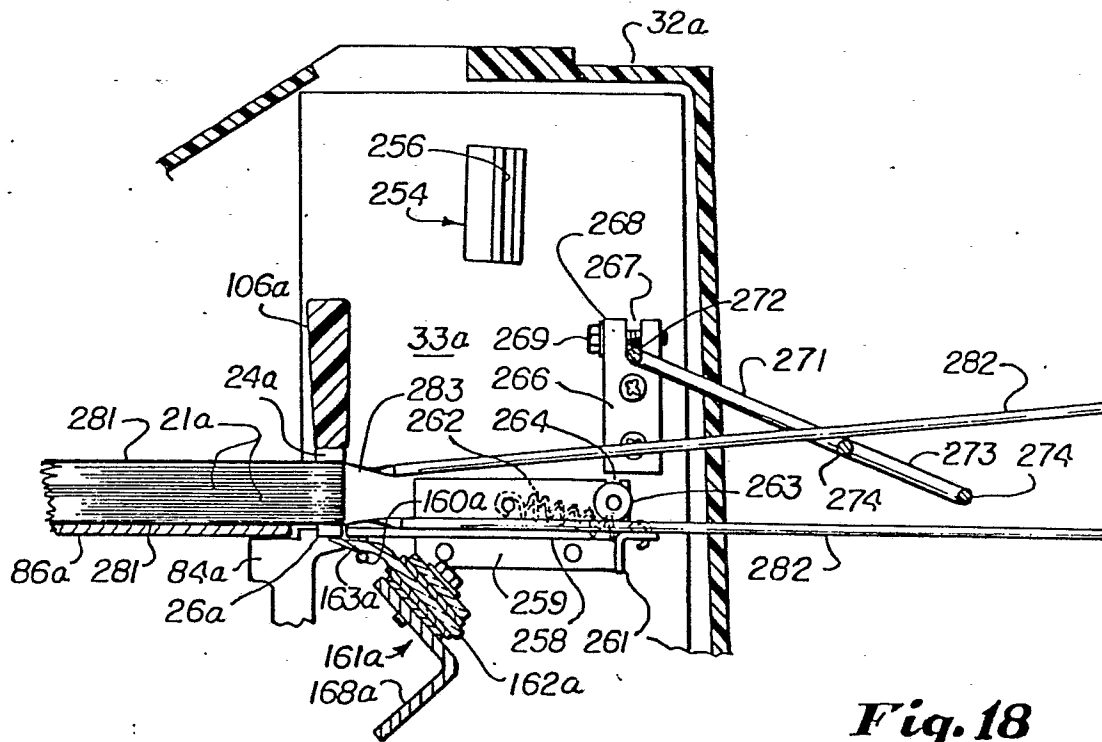
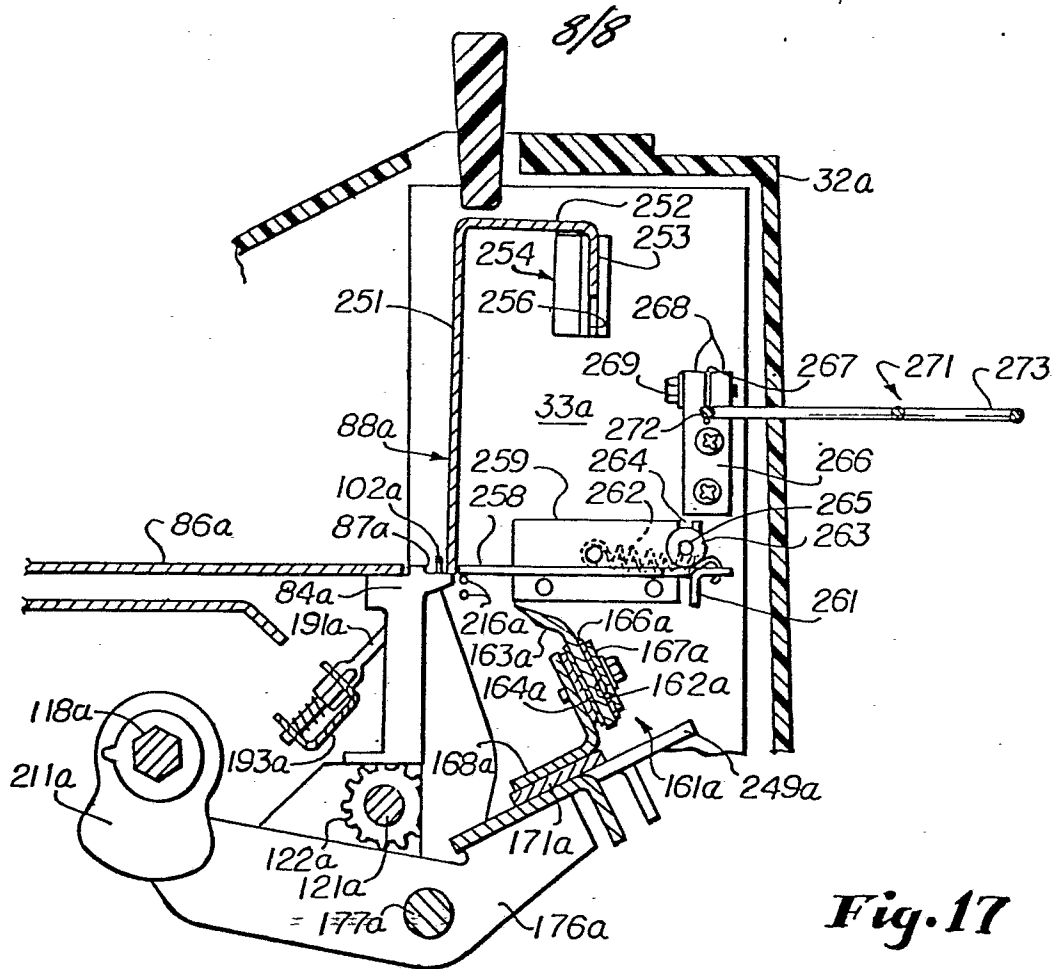


Fig. 16





European Patent
Office

EUROPEAN SEARCH REPORT

0040530

Application number

EP 81 30 2180

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl.)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
DA	<u>US - A - 4 079 647 (ELDER)</u> * Whole document *	1	B 42 B 5/08
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DA	<u>US - A - 3 811 146 (ABILDGAARD)</u> * Whole document *	1	
	--		
A	<u>US - A - 3 756 625 (ABILDGAARD)</u> * Whole document *	1	

			TECHNICAL FIELDS SEARCHED (Int. Cl.)
			B 42 B B 42 C
			CATEGORY OF CITED DOCUMENTS
			X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons
			&: member of the same patent family, corresponding document
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
The Hague	20-08-1981	MEULEMANS	