

[54] **PAPER BINDING MACHINE**
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[51] Int. Cl. B42c 19/00
[58] Field of Search 11/1 R, 1 A, 1 MB; 402/60, 402/61, 63, 68, 69; 40/120

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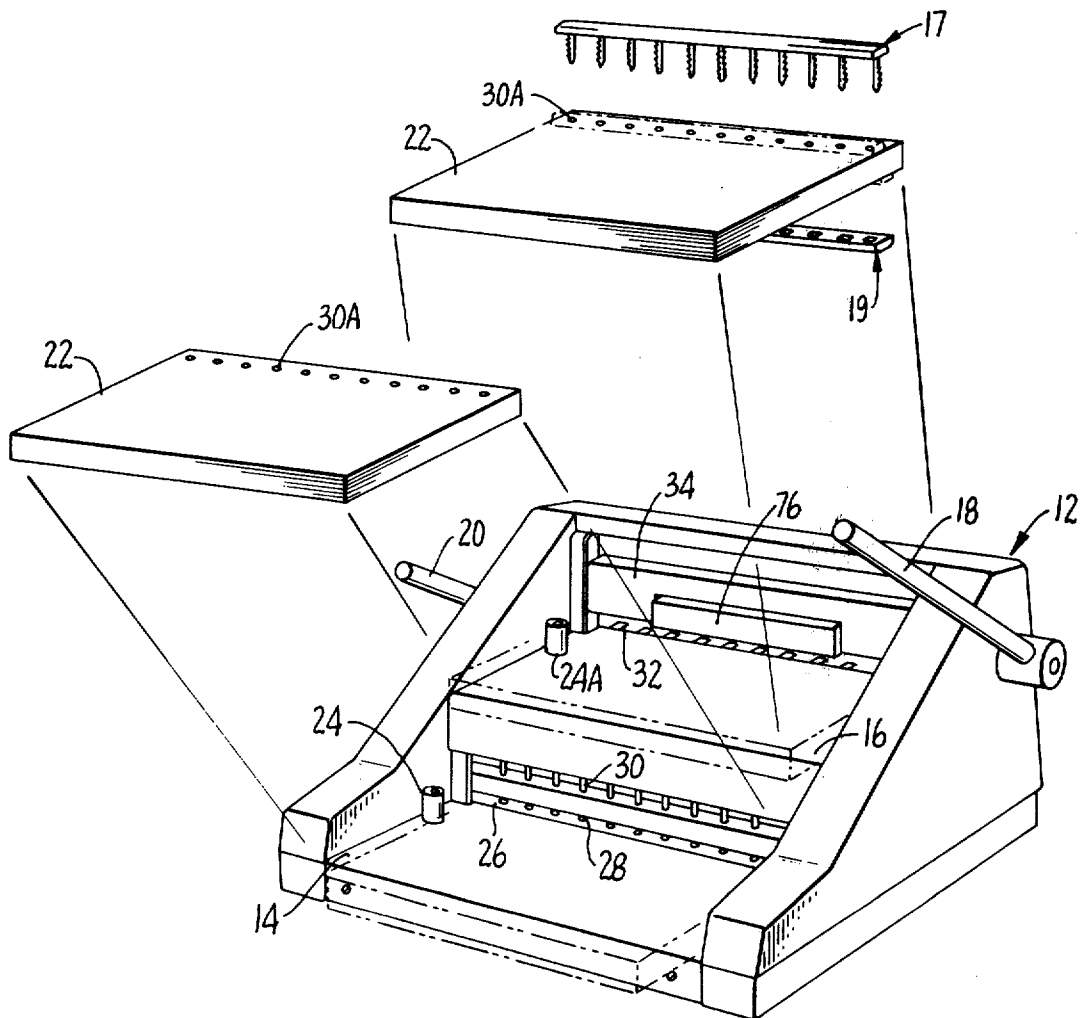
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Primary Examiner—Lawrence Charles
Attorney, Agent, or Firm—Robert G. Slick; John C. Barnes

[57] **ABSTRACT**

A machine is provided for binding papers utilizing binding strips of the type wherein one strip has a series of studs with ratchet teeth thereon and a mating strip has a series of holes for engaging the ratchet teeth and a series of blocking elements for locking the teeth in place to provide a permanent binding. The device of the present invention cuts off any excess length of the studs after the binding operation and, in a preferred embodiment of the machine, includes a punching device for punching holes in a sheaf of paper prior to the binding operation.

10 Claims, 15 Drawing Figures



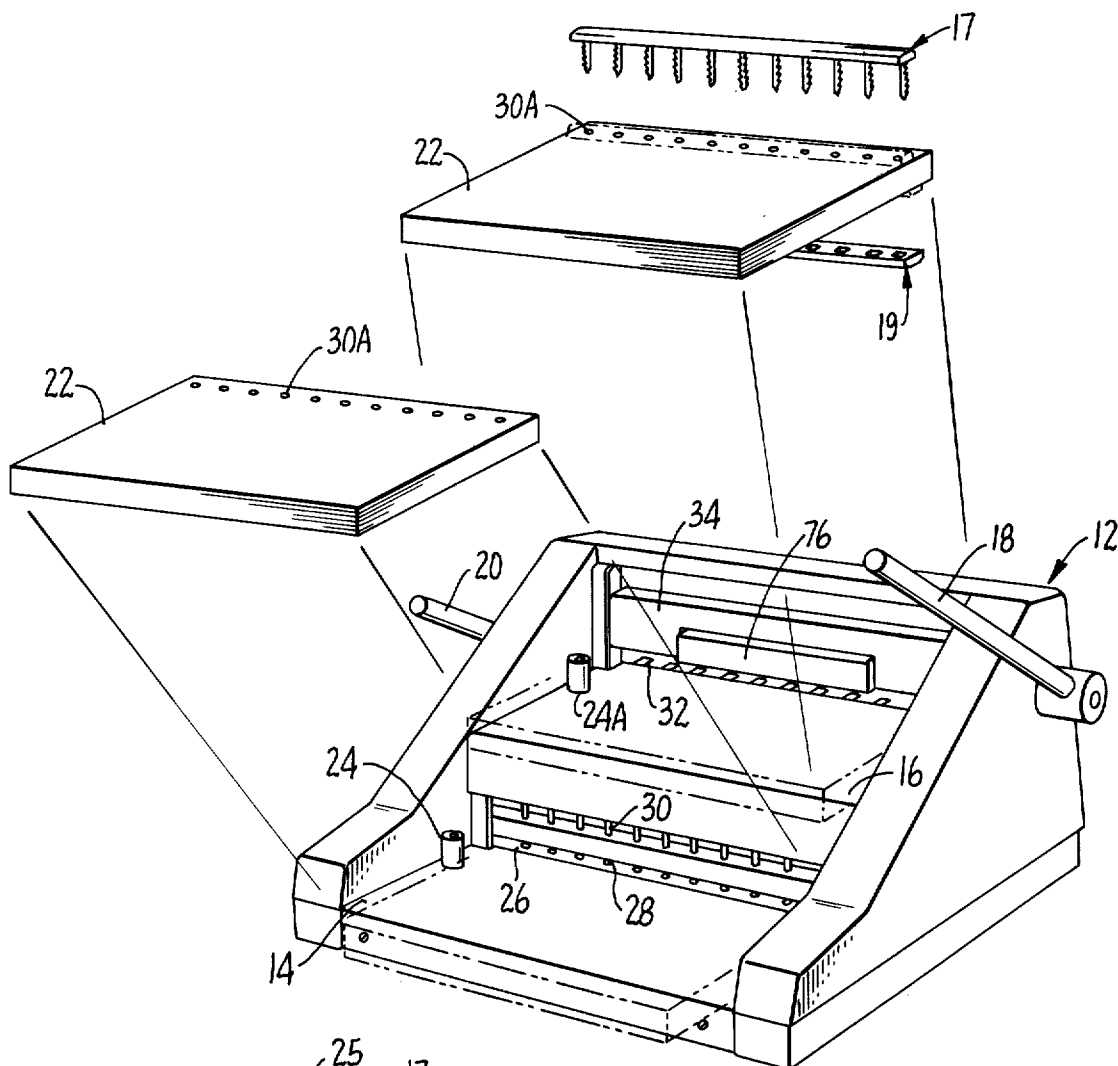


FIG. 1.

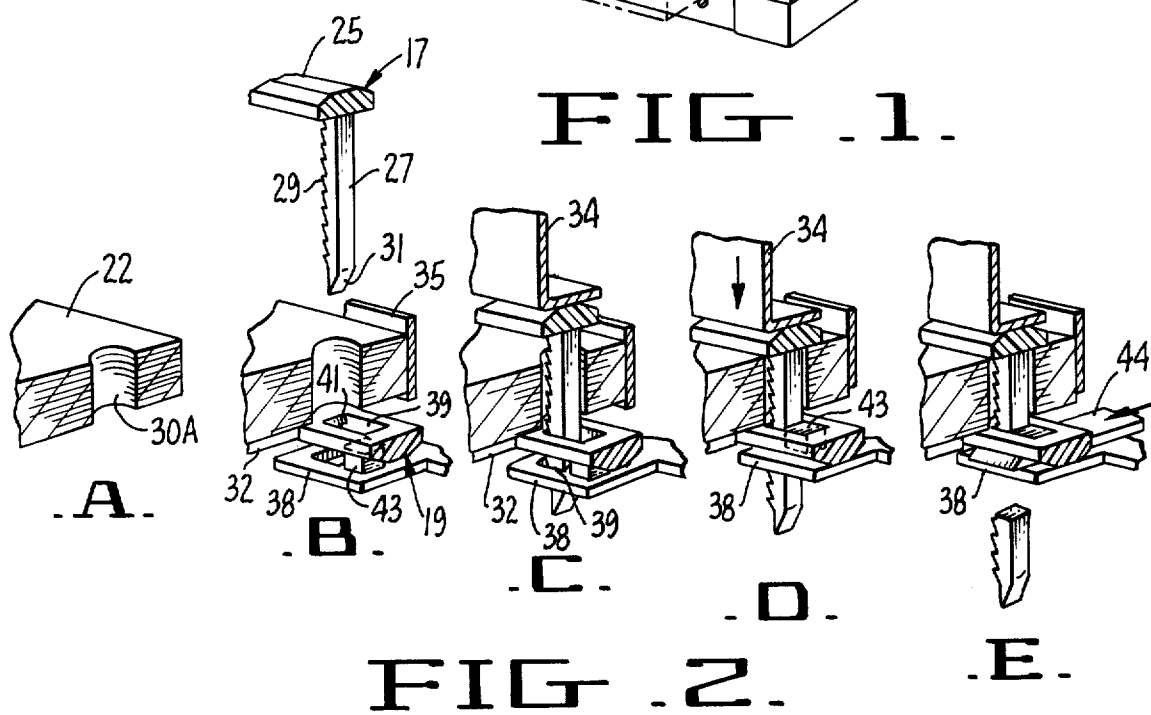
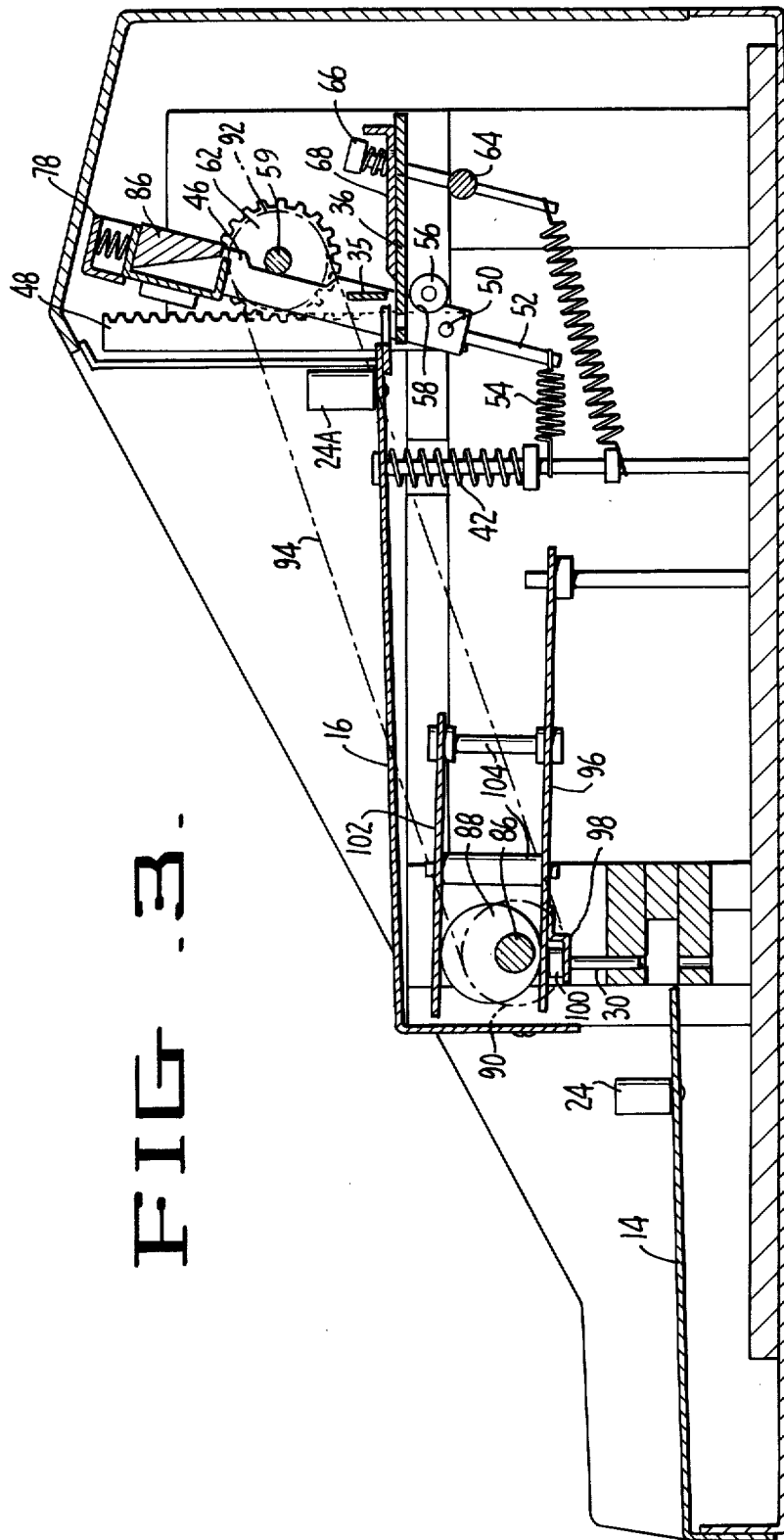


FIG. 2.



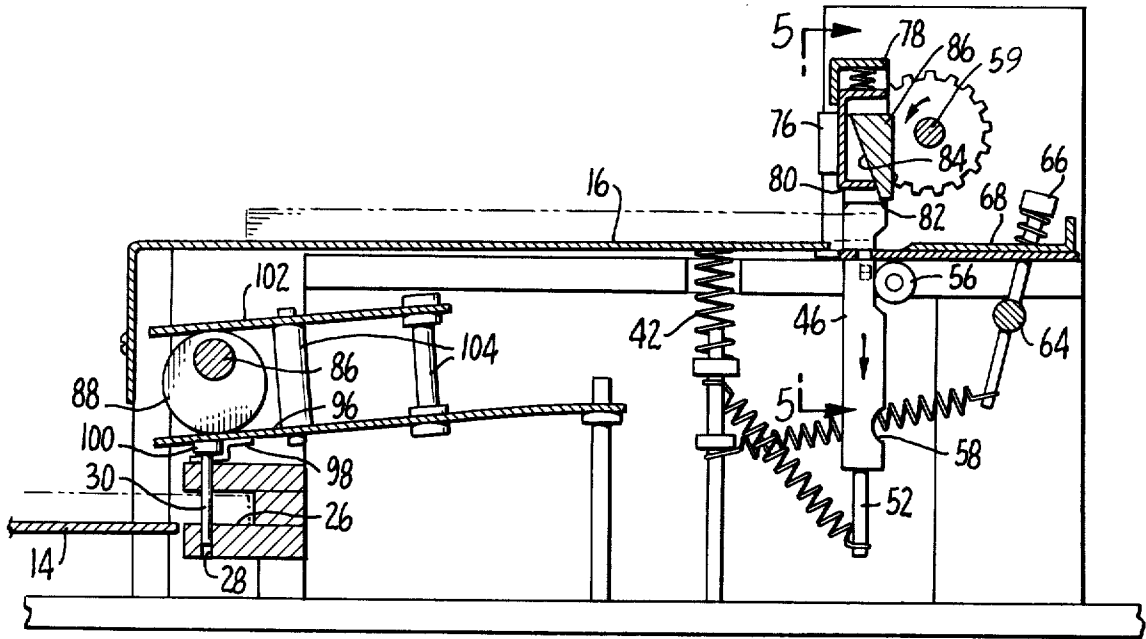


FIG. 4.

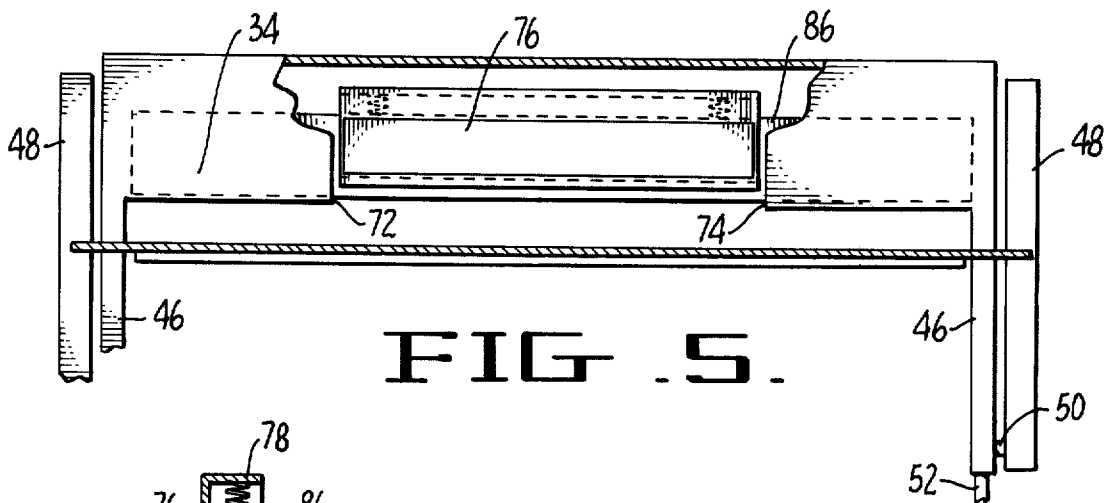


FIG. 5.

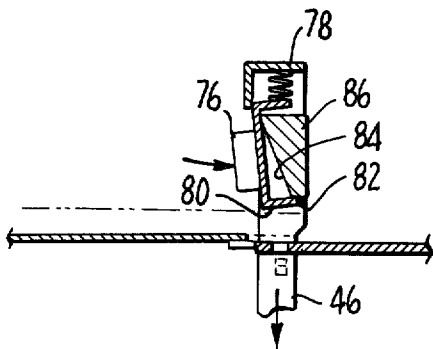


FIG. 6.

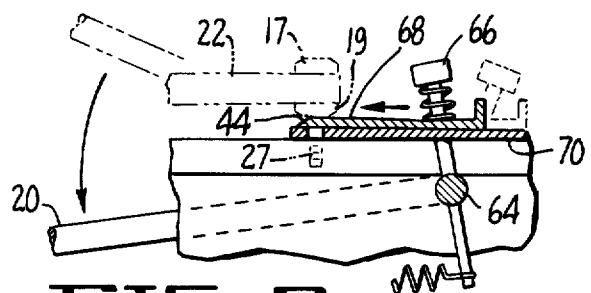


FIG. 7.

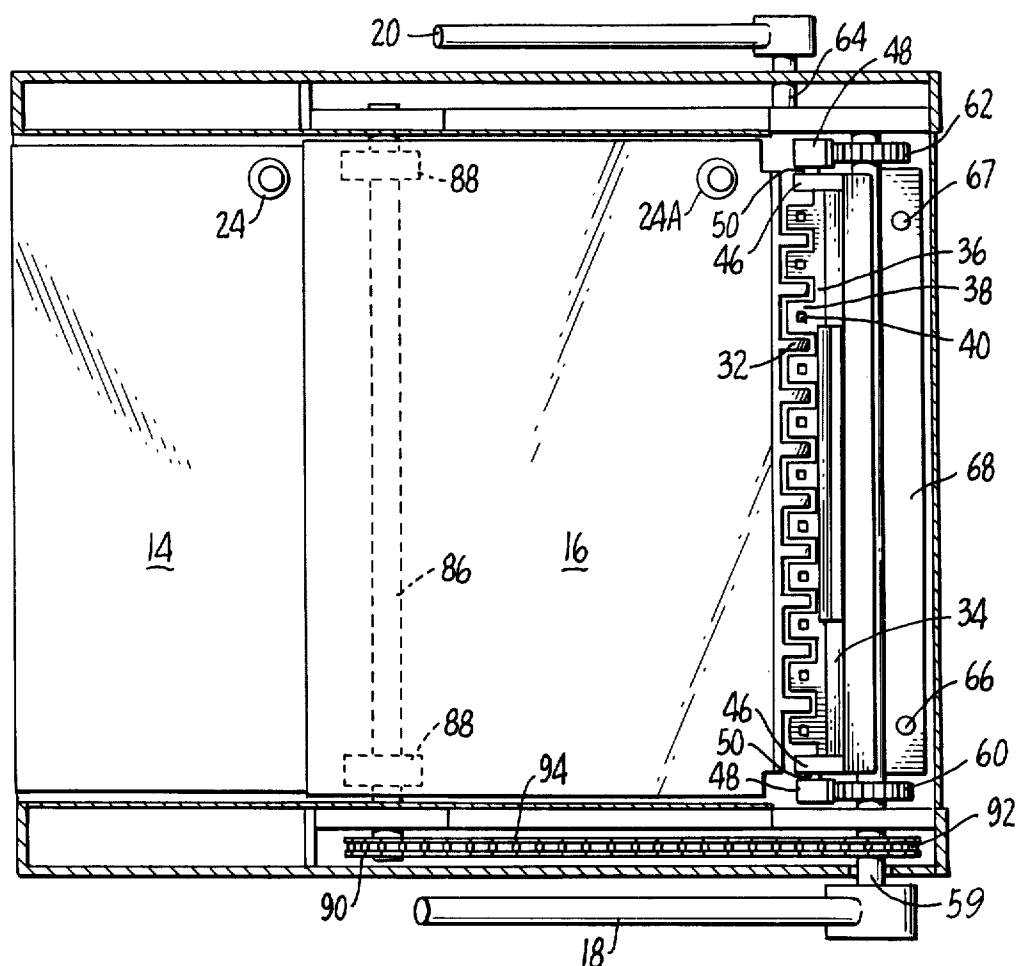


FIG. 8.

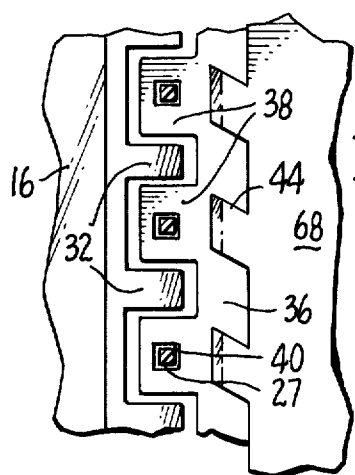


FIG. 9.

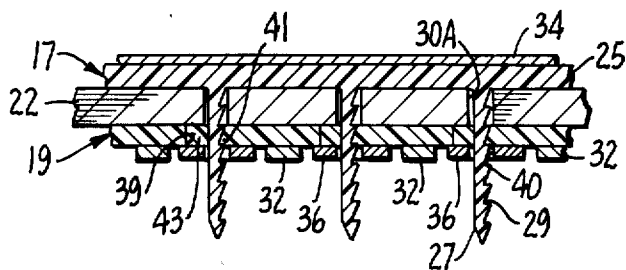


FIG. 11.

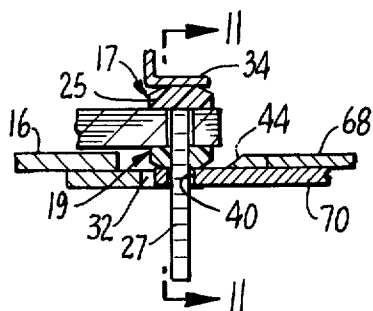


FIG. 10.

PAPER BINDING MACHINE

SUMMARY OF THE INVENTION

The present invention relates to a machine for inserting binding elements in a sheaf of paper or the like wherein the binding elements are of the kind described and claimed in my copending patent application Ser. No. 388,246 filed Aug. 13, 1973. According to said patent application, a binding system is provided utilizing a pair of backing elements or spines, one of which has a series of studs extending therefrom and the other of which has a series of mating holes. The studs have ratchet teeth thereon while the holes in the opposite spine have a single ratchet tooth and a locking block. When the two spines are pressed together, the teeth on each of the studs successively engages a mating tooth on each of the holes until the spines are fully compressed toward each other, at which time the block is moved in place behind the studs on the ratchet to lock the two elements together. Any excess stud length is then cut or trimmed off.

Although the operation of pressing the spines together, locking the blocks in place, and cutting off the excess spine length could be done by hand, it is convenient to provide a machine for performing these operations.

In a preferred embodiment of the machine a punch is also provided so that a single machine suffices to punch holes in a sheaf of papers for the studs and then to assemble and hold the sheaf in a finished binding.

The inventor is aware that others have provided machines for binding books and the like but generally speaking they have involved the application of heat and have required a large amount of power for operation.

The device of the present invention is a simple desk top machine which occupies little space and which is relatively simple and inexpensive to fabricate.

The device of the present invention does not involve the use of heat in any manner so that it is always ready for instant action.

Although the device of the present invention could be motor driven, it is easy to operate so that normally a motor is not required.

According to the present invention, a preferred embodiment of the devices includes a mechanism whereby pressure can be exerted on only part of the spine at a time, greatly reducing the effort needed to operate the machine.

Very little skill is necessary to operate the device of the present invention nor is it necessary that the user be particularly strong.

Various additional features and advantages of the invention will be brought out in the balance of the specification.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of a machine embodying the present invention.

FIG. 2 is a series of partial views A through E showing the sequence of operations conducted by the machine of the present invention.

FIG. 3 is a side view of the machine shown in FIG. 1, partly in section.

FIG. 4 is a partial view, similar to FIG. 3, showing the compression of a material being bound.

FIG. 5 is a section on the line 5—5 of FIG. 4.

FIG. 6 is a partial view in section of the pressing mechanism.

FIG. 7 is a partial view showing the cut off action of the machine.

FIG. 8 is a plan view of the machine, partly in section.

FIG. 9 is an enlarged partial view of the cut off mechanism.

FIG. 10 is an enlarged side view of the cut off mechanism.

FIG. 11 is a section on the line 11—11 of FIG. 10.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to the drawings by reference characters and particularly to FIGS. 1 and 2, the device of the present invention includes a frame generally designated 12 having two platens, namely, a lower platen 14 and an upper platen 16 mounted thereon. A handle 18 extends from one side of the machine which actuates the paper punching and binding mechanisms. A second handle 20 extends from the opposite side of the machine which is used to actuate the stud cut-off mechanism.

The device of the present invention is designed to be used with the binding elements which are fully described in my copending application above identified. The binding elements will not be described in detail but in general, they include an upper binding element generally designated 17 and a lower binding element generally designated 19; these are sometimes referred to as backing members. The upper binding element 17 includes a back or spine 25 having a plurality of studs 27 extending therefrom, each having a plurality of ratchet teeth 29 thereon and having a tapered, sharpened end 31. The lower binding element 19 has a back or spine having a series of apertures 39, each of which has a tooth 41 adapted to engage with the ratchet teeth 29. A block 43 is provided which is adapted to be wedged into hole 39 to hold one of the ratchet teeth 29 into contact with a ratchet tooth 41 in the opening. The blocks 43 form a series of protrusions on the lower binding element; each of said protrusions is located adjacent to one of the apertures 39.

The overall operation of the binding operation can now be understood by reference to FIGS. 1 and 2. A punched sheaf of papers 22 is first placed on the lower platen 14 with one edge against the guide 24 and with the back portion extending into slot 26 where it overlies a series of die hole 28 and is under a series of punches 30. As it will be later described in detail, the punches 30 are brought down by the actuation of lever 18, perforating the paper as is shown at 30A.

A lower binding element 19 is now placed at the rear of platen 16 and an upper binding element 17 is placed on the sheaf of papers with the studs extending through the holes in the paper and the assembly is placed on the platen 16 with the studs extending down into the lower binding element 19 and between the fingers 32 at the back of the platen. The stack of paper is placed against guide 24A at the side of the platen and against stop 35 at the rear of the platen. As is later explained in detail, at this point the lower binding strip 19 will be supported only on the fingers 32 and the locking blocks 43 are not in contact with the table. Lever 18 is now actuated by pulling it towards the user, which causes bar 34 to descend, squeezing the two binding strips together. As pressure is increased, the locking blocks 43, by

means later described, will be pushed into place, locking the ratchet teeth on stud 27 with the mating tooth on the backing member 19. With the parts then locked in place, lever 20 is actuated by pulling it forward, cutting off the surplus ends of the studs and leaving the finished bound papers.

For a more detailed description of the exact structure of the machine, reference is made to FIGS. 3 through 11. Mounted rigidly near the back of the machine is a shelf-like projection 36 having a series of projections 38, each of which has a square hole 40 therein, corresponding roughly in size to the cross section of a stud 27. Projections 38 mesh between fingers 32 as is best seen in FIG. 8. Platen 16 supports the series of fingers 32. The spacing of the fingers 32 is such when the backing strip 19 is placed thereover, it will be supported on the fingers 32 at spaced intervals between the holes 41 and will not come in contact with the blocks 43. A rear stop 35 is provided to line up the sheaf of papers with the rest of the binding mechanism. Platen 16 is biased upwardly by a spring 42 so that there is sufficient vertical clearance between fingers 32 and projections 38 so that no pressure will be brought on the blocks 43 when ram 34 first descends. As the ram 34 descends, the sheaf of papers is first compressed and the backing members 17 and 19 seated firmly together as is shown in FIG. 2C. Now as a ram 34 continues to descend as is shown in FIG. 2D, the resistance of spring 42 is overcome, allowing platen 16 to move downwardly, so that the platen 16 bottoms out on the plane of the tabs 38 and pressure is now brought on blocks 43, forcing them up into locking position as is shown in FIG. 2D. As the binding elements are now locked together, lever 20 is moved forward, causing a knife blade 44 to cut off the excess length of stud 27 as is shown at FIG. 2E. The binding operation is now complete and the bound volume can be removed and the operation repeated.

Having now described the general operation of the machine, certain specific parts contributing to the operation will be described in detail.

Ram 34 which is actuated by the movement of lever 18 is mounted on downwardly extending arms 46 which are pivoted to racks 48, located on each side of the machine by means of pins 50. Arms 52 extend downwardly beyond the pivot point 50 and springs 54 mounted on each of the arms tend to pull the bottom of arms 52 forward so that in its upper position, the ram element 34 is pulled backwardly and away from platen 16 to facilitate loading the machine as is shown in FIG. 3. A roller 56 extends across the machine and the arms 48 are cut out at 58, permitting the ram element 34 to extend more to the rear in its uppermost position.

Handle 18 is mounted on a shaft 59 which carries pinions 60 and 62 which engage the rack 48. When the arm 18 is in its uppermost position, racks 48 are substantially at the top of their path and the ram element 34 is pulled to the rear by means of spring 54 as described. Now as the arm is pulled forward, the racks move downwardly pulling the arms 46, causing the ram 34 to move forward out of the openings 58 and down to press the binding elements together.

First, of course, the binding elements fully engage and compress the sheaf of papers and as pressure arm 18 is continued, the resistance of spring 42 is overcome and the blocks move into place, locking the assembly together. Arm 18 is now released since the papers are fully compressed and locked together.

Arm 20 is now pulled forwardly to actuate the cut off mechanism. Arm 20 is mounted on shaft 64 which carries two pins 66 and 67 which pass through holes in the knife back 68. Back 68 is mounted to slide on a plate 70 mounted on the frame of the machine. The knife back 68 carries a plurality of wedge shaped knives 44 which correspond in placement and number to the projections 38 and pass between the fingers 32. Thus, as handle 20 is pulled forwardly, the blades 44 slide along the projections 38 and between the fingers 32, cutting off the portions of the studs 27 which extend beyond backing member 19. This operation can best be understood by reference to FIGS. 2E and FIG. 7. The binding and cutting operation is now complete and the bound sheaf of papers can be removed from the machine.

In a preferred embodiment of the machine, the ram element generally designated 34 is made double acting so that only a portion of the sheaf of papers is compressed at one time whereby the machine is made more compact and less effort is needed to pull the lever 18 forward, compressing and locking the sheaf of papers. To accomplish this, the ram 34 has a central cut away portion between the shoulders 72 and 74, leaving an open central portion. A secondary ram 76 is mounted in this opening and is held on springs 78. The secondary ram 76 has a lip 80 extending along its bottom which can engage a shoulder 82 or can slide along a ramp 84, both of which are located on a bar 86 which is attached to arms 46 and which holds the main ram element 34. With the parts in the position shown in FIG. 4, if the ram 34 is brought down by action of the handle 18, the secondary ram 76 will ride along the ramp 84 and will be pushed outwardly so that no pressure will be brought near the center of the sheaf of papers and that the entire pressure of the ram will be exerted at the ends. This action is best seen in FIG. 5. Now, after the ends are compressed, handle 18 is returned to its retracted position and the user pushes in and holds the secondary ram 76 as is shown in FIG. 6. Now the bottom lip 80 engages the shoulder 84 and as the handle 18 is again brought forward, pressure is brought on the center of the sheaf of papers. Thus, by compressing and locking in two separate stages, less effort on the part of the user is required. Of course, this secondary ram can be eliminated, or can be locked under the shoulder 82, so that the entire compressing and locking operation is conducted with a single movement of the lever 18, which is particularly advantageous in a simpler machine or when one is binding a relatively thin sheaf of papers.

As was stated earlier, the machine of the present invention preferably embraces a punching device so that the entire operation of punching and binding can be conducted in a single machine. The punching mechanism which is used to actuate the punches 30 can best be understood by reference to FIGS. 3 and 4. A shaft 86 carries an eccentric 88 mounted over plate 96. Shaft 86 has a sprocket 90 mounted thereon while a mating sprocket 92 is mounted on shaft 58. A roller chain 94 connects the two sprockets. The plate 96 extends over the punches and carries a series of clips 98 which are hooked under heads 100 on punches 30. An upper plate 102 is held to plate 96 by means of rods 104 and serves in conjunction with clips 98 to retract the punches. Thus, as handle 18 is moved forward, it not only actuates the compressing and locking mechanism

previously described, but also actuates the punches. One could conduct a punching operation on one sheaf of papers on platen 14 while the binding operation is conducted on platen 16. However, in most instances, only one operation would be conducted at a time so that the sheaf of papers would first be punched on platen 14 and finally bound on platen 16 as previously described.

Although certain specific details of the machine and its method of operation have been set forth, it will be obvious to those skilled in the art that many variations can be made on the exact structure shown without departing from the spirit of this invention. For instance, the machine could easily be adapted for power operation. Separate actuating levers can be used for the binding and punching operations.

I claim:

1. A machine for assembling a perforated sheaf of papers into a bound volume wherein the binding element utilized consists of a first backing member having a series of studs thereon, each stud having ratchet teeth and a second backing member having a series of mating holes with at least one ratchet tooth in each of said holes positioned to mate with a tooth on a stud inserted therein and with a blocking member for locking a ratchet tooth on each of the studs to a ratchet tooth in a hole, comprising in combination:

- a. means for supporting said second backing member while leaving said blocking means free of said supporting means,
- b. means for corresponding said backing members together with the studs passing through the perforated sheaf of papers and into the holes whereby the ratchet teeth engage and hold the sheaf of papers in bound relationship,
- c. means for moving said blocking means into place to lock said ratchets together, and
- d. means for cutting off an excess length of said studs extending beyond said second backing means.

2. The machine of claim 1 wherein said blocking means include protrusions on the second backing strip

located adjacent to each of said holes and the support means (a) comprises a series of fingers extending between said protrusions.

3. The machine of claim 2 wherein a platen biased upwardly is provided for receiving a sheaf of papers, said platen having a series of fingers extending therefrom to support the second backing member between said protrusions, said machine having a fixed member under said fingers whereby pressure on said platen with the extending fingers will overcome the bias, bringing the protrusions into contact with said fixed members, forcing said protrusions into said holes.

4. The machine of claim 3 wherein said platen with said extending fingers is biased upwardly.

5. The machine of claim 1 having a shaft passing through the machine with pinions thereon, and a ram is provided with mating rack teeth, whereby turning said shaft causes said ram to descend into contact with said backing members to compress the same.

6. The machine of claim 5 wherein said ram is divided into two transverse sections having interconnected release means whereby one of said sections can be released so that actuation of said shaft causes only one of said two sections to move into compressive relationship to said backing members and can be engaged whereby both sections move into compressive relationship to said backing members.

7. The machine of claim 3 having a second platen with punch means thereon for perforating a sheaf of paper.

8. The machine of claim 7 wherein a single shaft actuates the compression means and the punch means.

9. The machine of claim 1 wherein the cut off means comprises a plate having a plurality of cutting knives extending therefrom, and having a handle to move said knives into and out of cutting relationship.

10. The machine of claim 7 having two extending handles, namely a first handle to actuate the compression means and the punch means, and a second handle for actuating the cut off means.

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