Oct. 15, 1974 W. H. ABILDGAARD ET AL Re. 28,202

BOOK FORMED OF PLASTIC STRIPS AND STUDS

Original Filed Feb. 13, 1969 3 Sheets-Sheet 1

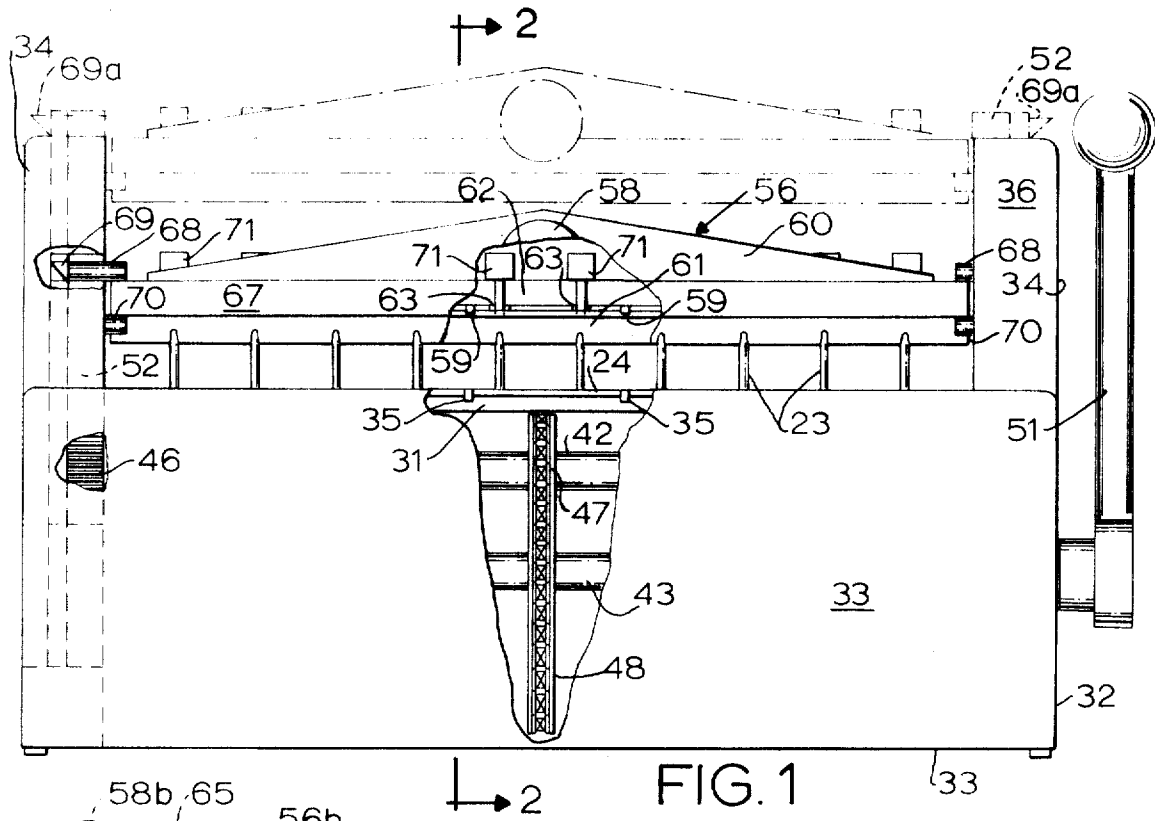


FIG. 1

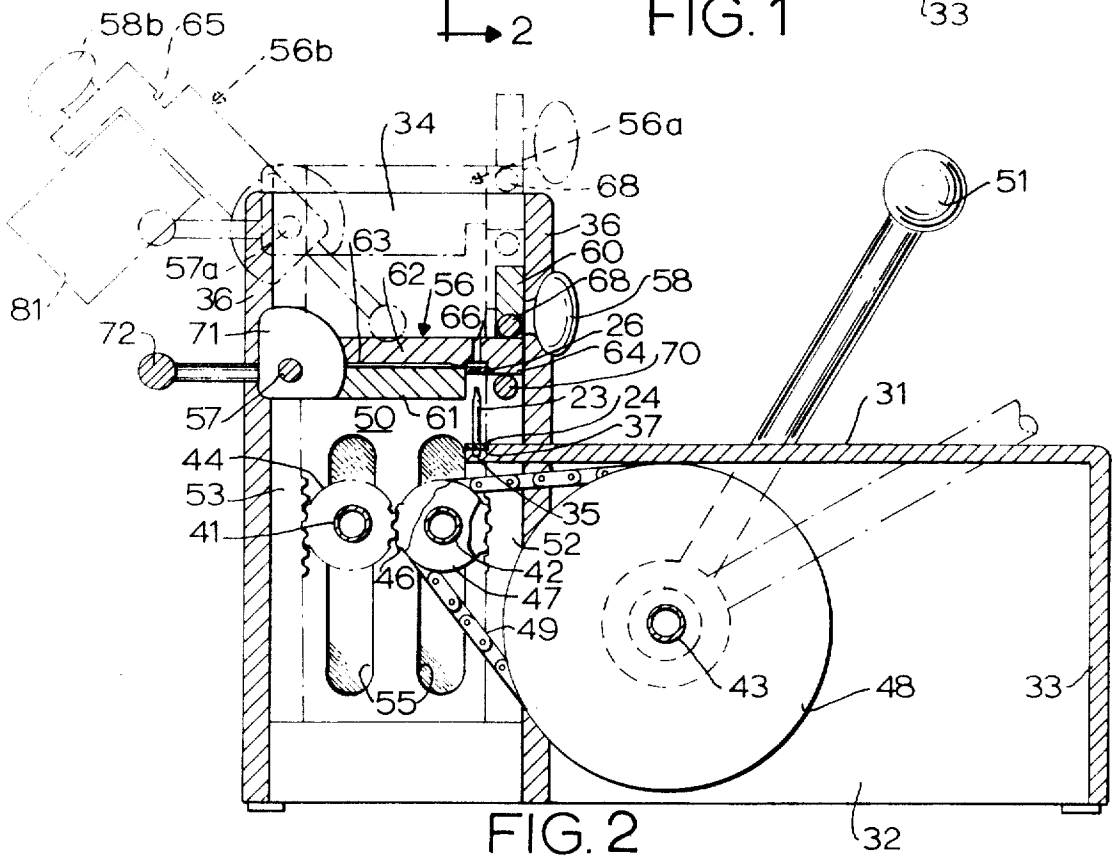


FIG. 2

BOOK FORMED OF PLASTIC STRIPS AND STUDS

Original Filed Feb. 13, 1969 3 Sheets-Sheet 2

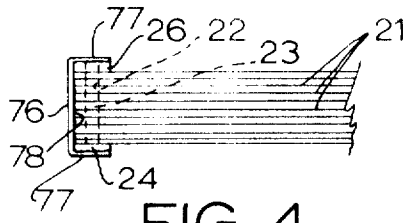


FIG. 4

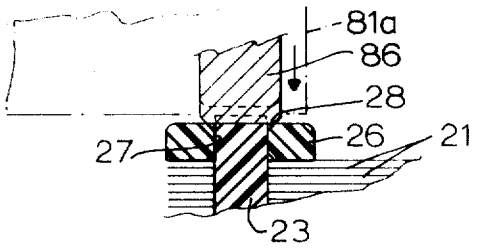


FIG. 5

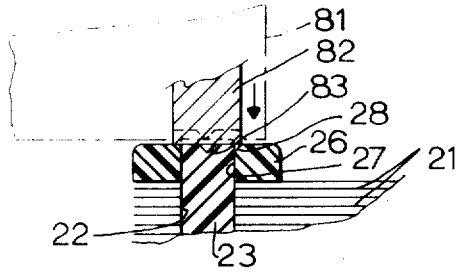


FIG. 6

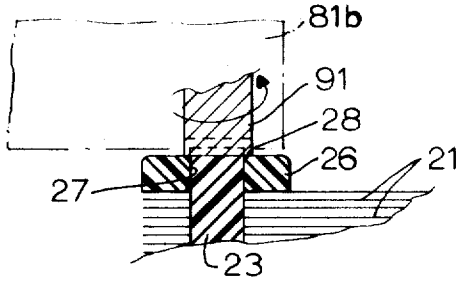


FIG. 7

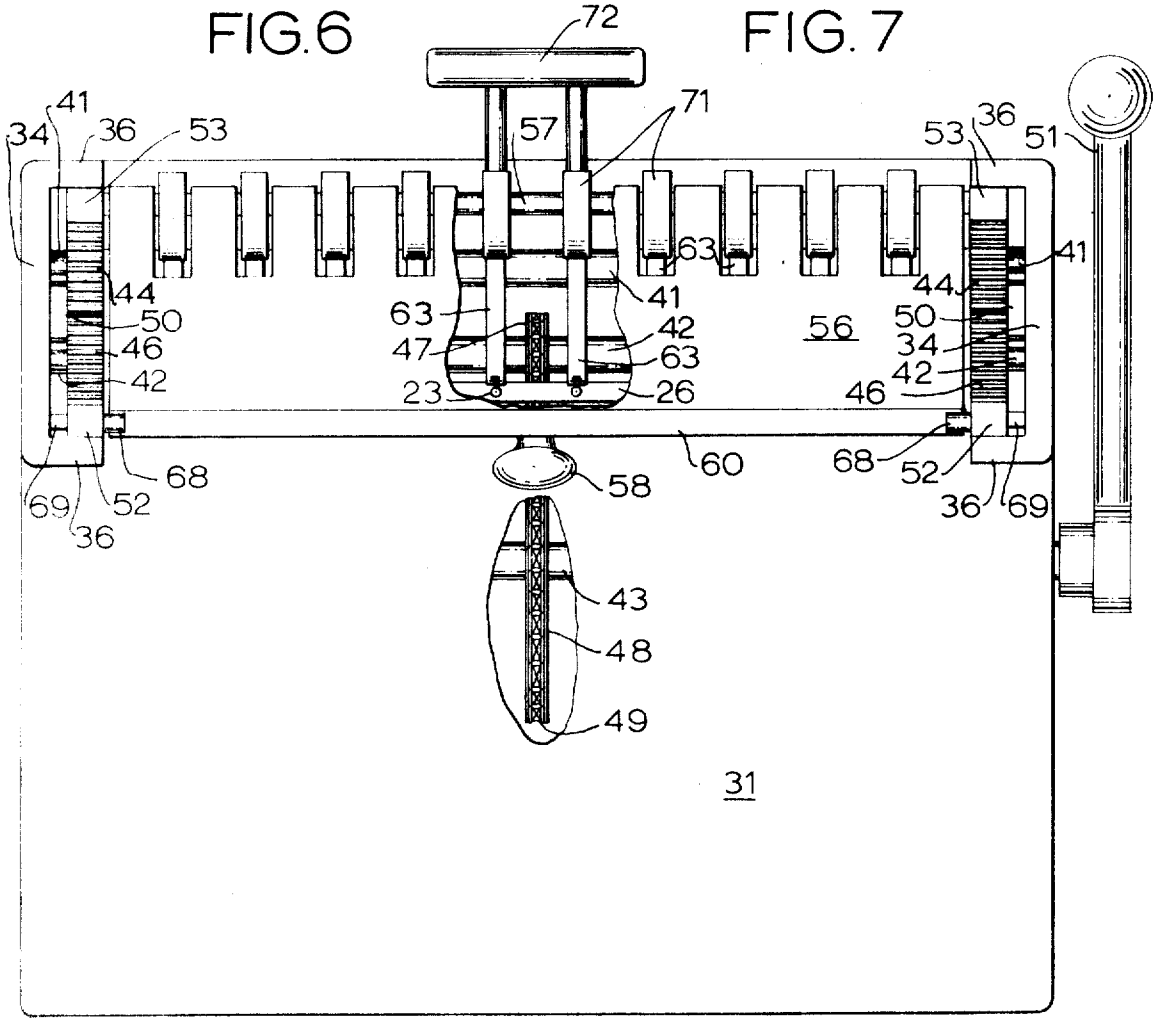
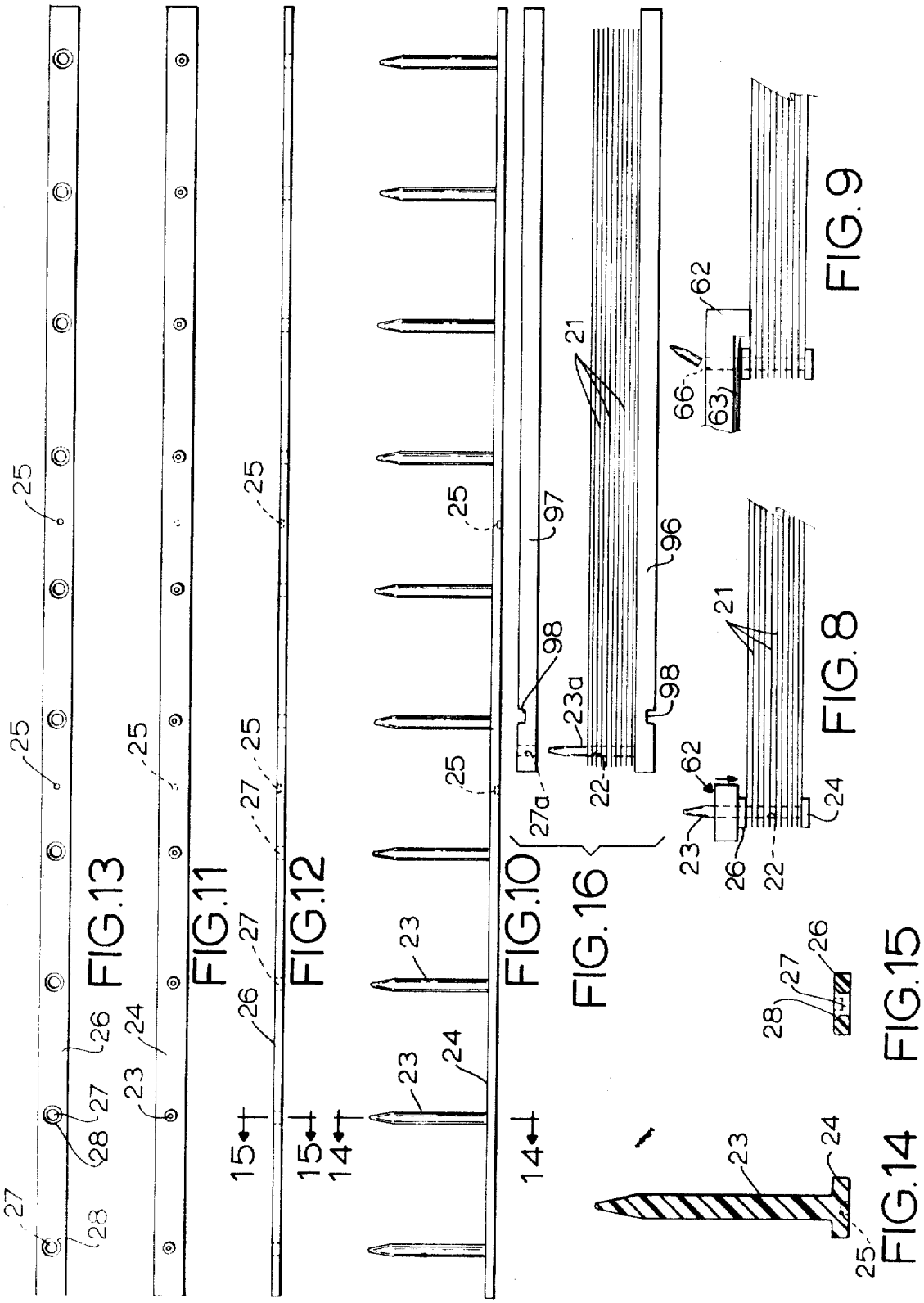


FIG. 3

BOOK FORMED OF PLASTIC STRIPS AND STUDS

Original Filed Feb. 13, 1969 3 Sheets-Sheet 3



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BOOK FORMED OF PLASTIC STRIPS AND STUDS

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Int. Cl. B42d *1/06*

U.S. Cl. 281—21 3 Claims

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

ABSTRACT OF THE DISCLOSURE

A first strip having longitudinally spaced, upstanding studs and a second strip having holes corresponding in spacing to, and of a size slightly smaller than, the studs are used to bind sheets apertured adjacent one margin to receive the studs. Apparatus provides a support for the first strip with the studs fitting through the holes in the sheets. A retractable member which receives the second strip is slidable toward the first strip and compresses the sheets against the first strip. Shear means in the retractable member sever the excess length of the studs projecting through the holes in the second strip. The studs are then frictionally held by the second strip. Means is provided for more permanently holding the strips in position, as by deforming the ends of the studs. The product is a [temporary or] permanent binding for [paper] sheets *such as paper, which are* apertured adjacent one margin having a first strip on one edge carrying studs [projecting] *received* in undersized holes in a second strip. The studs are cut off to length and temporarily held in the second strip by friction or by more permanent means involving deformation of the severed ends of the studs.

This invention relates to a new and improved apparatus for binding apertured sheets and to the *improved* product produced by such apparatus.

Basically, the present invention provides an office-type combination press and shear which is used to assemble apertured loose or previously bound sheets and to bind them together. The apparatus uses two strips, one having spaced studs which project through the apertures in the sheets and the other strip being apertured to receive the studs. The two strips are pressed together with the pages to be bound interposed and with the studs fitting through the holes in the pages. The excess lengths of the studs are sheared off. The holes in the second strip are sufficiently undersized to frictionally hold the assembled product together at least temporarily. However, as hereinafter explained, a variety of different ways may be used to more permanently secure the product in assembled condition.

One of the features of the invention is the fact that it accepts a variety of different types of pages. One such type is a stack of ordinary paper which has been punched or drilled adjacent one of its margins. A second type paper is looseleaf, previously punched paper. In addition, it is sometimes desirable to rebind books or to bind assembled pluralities of books, pamphlets, catalogs and the like. For this operation, the material is punched or drilled adjacent one margin thereof. The versatility of the apparatus as far as the variety of material accepted is one of the principal features of the invention.

Another feature of the invention is the fact that a considerable range in the thickness of the pages is accommodated. The studs of one of the strips heretofore mentioned are of extended length to fit a relatively thick book. The apparatus shears off the excess lengths of the studs where less than the maximum length is required. Furthermore, the effectiveness of the bond is relatively independent of the thickness of papers involved. In addition, the apparatus will accept a variety of sizes of the sheets within limits.

A further feature of the apparatus is the fact that the sheets are tightly pressed together *uniformly by the strips which extend along the length of the bound margin of the book* and then locked in place in *clamped* compressed condition.

Still another feature of the invention is the fact that the strips are first frictionally locked together by the apparatus. If desired, various means may be used to more permanently secure the product in assembled condition. Among such means are various ways of deforming the severed ends of the studs as by swagging, cold forming, hot forming or the like. The strips may be covered by a booklet cover or by a binding strip which conceals the ends of the studs.

One of the features of the invention is the fact that *the clamping structure for the sheets consists of only two components and is spineless. Consequently,* it is easily operated by relatively untrained personnel. Little physical effort is required to operate the machine and the operation is rapid.

In the drawings:

FIG. 1 is a front elevational view of the apparatus which is the subject of this invention, partly broken away in section to reveal internal construction.

FIG. 2 is a vertical sectional view taken substantially along the line **2—2** of FIG. 1.

FIG. 3 is a top plan partly broken away in section to reveal internal construction.

FIGS. 4 to 7, inclusive, are fragmentary, enlarged schematic sectional views showing means for permanently binding the product together.

FIGS. 8 and 9 are schematic sequential steps in the compressing and shearing methods performed by the apparatus.

FIG. 10 is a side elevational view of one of the strips used in forming the product.

FIG. 11 is a top plan thereof.

FIG. 12 is a side elevational view of another of the strips so used.

FIG. 13 is a top plan thereof.

FIG. 14 is an enlarged sectional view taken substantially along the line **14—14** of FIG. 10.

FIG. 15 is an enlarged sectional view taken substantially along the line **15—15** of FIG. 12.

FIG. 16 is an exploded side elevational view of a modified structure, similar to FIGS. 10 and 12.

The apparatus hereinafter described is used to bind together [either temporarily or permanently] sheets of paper or the like which are designated in the accompanying drawings generally by reference numeral **21**. Each sheet is formed with a series of spaced holes **22** along one margin thereof, the spacing *intervals* between the holes corresponding to the spacing of [the] *integral solid* studs **23** [of] *integral with* first strip **24**, hereinafter described. The holes **22** may be made by means of a paper punch. Occasionally, it is desirable to cover a book such as a paperbound book. Where the thickness of the book makes punching unsatisfactory, holes **22** may be drilled. The dimensions of the pages **21** which are accepted by the apparatus hereinafter described are subject to considerable variation, the apparatus being made large enough to accommodate a range of sizes although a length of page of 11 inches is standard. The thickness of the

sheets which are to be bound is likewise subject to variation between a very few sheets and a thickness of sheets which is within the limits of the length of the studs **23** of the strip **24**. Used in conjunction with strip **24** is a second strip **26** having a series of holes **27** formed therein which correspond in spacing to the distance between studs **23**. The diameter of the holes **27** is preferably slightly less than the diameter of the studs **23** so that when the product is assembled, the parts will be held in frictional engagement against reasonable stress. As hereinafter appears, in some of the more permanent means of bonding the strips **24**, **26** together, a counter sink **28** may be formed in one surface of strip **26** at each hole **27**.

The length of strips **24** [-inch] *is* subject to variation, but where 11-inch pages are being bound, the overall length is preferably 11 inches, although an overlap may be provided where cover larger than the pages is used. The strips are [preferably] *advantageously* molded or otherwise formed of a plastic material. One suitable material is a rigid polyvinyl chloride which is thermoplastic. Polystyrene is also suitable for such strips. In permanent bonding, it is desirable, as hereinafter appears, to distort the ends of the studs **23** after they have been sheared off by heat either by direct application of a hot iron or by spinning. Further, it is sometimes possible to distort the end of the stud by cold forming as by swagging. The plastic elected should be suitable for such purposes. To facilitate locating strips **24**, **26** in the apparatus, as hereinafter explained, depressions **25** are formed in the undersides of said strips at fixed locations.

The apparatus used is preferably suitable for installation on an office desk and hence is relatively small and compact. A horizontal table **31** is provided having depending sides **32** and a front **33**. The top inner edge of the table **31** is provided with a transverse ledge **37** dimensioned to receive strip **24** with studs **23** extending upward. Pins **35** fit into depressions **25** in strip **24** to locate same longitudinally. The back end of table **31** are side pieces **34** which project above the table **31** and have inward turned marginal flanges **36**. Extending between sides **34** below the level of table **31** are horizontal transverse shafts **41**, **42** and forward of shafts **41**, **42** is transverse shaft **43**. At either end of shafts **41**, **42** are matching spur gears **44**, **46** repectively. At its center, shaft **42** carries sprocket **47** and shaft **43** carries sprocket **48**. Sprockets **47**, **48** are interconnected by chain **49**. Outside the right-hand side **32** is handle **51** on shaft **43**. When handle **51** is pulled forwardly, gears **44** are caused to revolve. On either side of the machine reciprocating vertically within members **34** are front and rear racks **52**, **53** respectively, which mesh with gears **44**, **46**, and are interconnected by vertical plates **50** formed with elongated vertical slots **55** through which shafts **41**, **42** extend. Hence, when handle **51** is moved, the turning of gears **44**, **46** causes the racks **52**, **53** to reciprocate vertically in unison.

Press block assembly **56** is pivoted by means of horizontal transverse shaft **57** to the rear racks **53**. Press block **56** in its operative position is shown in full line in FIG. 2. When the handle **51** is turned so that the racks **52**, **53** are fully elevated, the shaft **57** assumes the position indicated by reference numeral **57a** in FIG. 2. When thus located, the handle **58** attached to upstanding flange **60** on the front of assembly **56** is pushed rearwardly to the dotted line position shown by reference numeral **58b**, at which position the assembly **56** is fully retracted. In fully retracted position, ledge **37** is exposed for installation of strip **24** and the pages **21** are installed in position over the studs **23** or such installation may be previously performed and the pages and strip **24** installed as shown in FIG. 2.

Assembly **56** has a lower part **61** and an upper part **62** separated by openings within which reciprocate shearing blades **63**. Part **61** terminates immediately inside ledge **37** in the operative position of the device to provide a recess **65** for strip **26** between the inner edge of plate **61** and a lip **64** projecting down from the forward edge of plate **62**. Pins **59** fit into depressions **25** in strip **26** to locate same accurately in position relative to strip **24**. Holes **66** are formed in plate **62** in alignment with studs **23**.

Forward rack **52** carries a pin **70** upon which ledge **64** rests in the operative position of press block assembly **56**. Rack **52** also carries a horizontally reciprocating detent **68** which engages the top of flange **67** in the operative position. The outer end **69** of detent **68** is bevelled and is biased outwardly by a spring (not shown). In the upper position of the press block assembly indicated by reference numeral **56a** in FIG. 2, the detent **68** is projected outwardly so that its end **69a** overhangs the upper edge of member **34** and its inner end clears flange **67**. Hence, the assembly **56** can be pivoted counterclockwise as indicated in FIG. 2 by reference numeral **34** and its inner end clears flange **67**. Hence, the assembly **56** can be pivoted counterclockwise as indicated in FIG. 2 by reference numeral **56b** to fully retracted position. When the assembly **56a** is pivoted clockwise from the position **56b** to the position **56a** and is depressed, the end **69** engages the upper edge of side piece **34** and is pressed inwardly. Thereupon the detent **68** engages the top of lip **67**, locking the assembly **56** for movement with the racks **52**, **53**.

The handle **51** is turned clockwise as viewed in FIG. 2 until the assembly **56** is lowered so that the tops of the studs **23** enter the holes **27** of strips **26** and the movement is continued until the paper **21** is compressed between table **31** and lip **64**. Shaft **57** carries a plurality of cams **71** which engage the ends of shearing blades **63** reciprocating between parts **61**, **62** and biased by springs (not shown) to inoperative position. Certain of the cams **71** are connected to handle **72**. When handle **72** is pulled forwardly, the cams **71** cause the blades **63** to move inwardly and to shear off the ends of studs **23** above the level of strip **26**.

The sequence of operation of the apparatus shown in FIGS. 1–3 is as follows: The press block assembly is in open position as indicated by reference numeral **56b** in FIG. 2. Strip **26** is inserted in recess **65**. Strip **24** is installed on ledge **37** with studs **23** uppermost. The paper **21** is inserted over the studs **23**, it being understood that this operation may be performed before the strip **24** is installed. The assembly **56b** is pulled forward to the position indicated by reference numeral **56a** by grasping the handle **58**. Thereupon the ends **69** of detent **68** are pushed inwardly as the press block assembly and racks **52**, **53** move downward so that the defect **68** engage the tops of lip **67**, locking the assembly **56** for movement with the racks **52**, **53**. Handle **51** is pulled in a clockwise direction, causing the assembly **56** to be lowered so that the upper ends of studs **23** enter the holes **27** and then penetrate the holes **66**. This movement is continued until the paper is compressed, between table **31** and lip **64**. In other words, the studs **23** extend as far as possible through the holes **27** in strip **26**, commensurate with the thickness of pages being bound. Thereupon, the shear handle **72** is pulled forwardly, cams **71** causing the blades **63** to shear off the ends of studs **23** above strip **26** (see FIG. 9). Handle **72** then returns to initial position. Handle **51** is also returned to initial position, causing the press block **56** to rise to upper position where it is then opened by pivoting backward so that the bound pages can be removed.

The foregoing operation causes friction engagement of strip **26** with the studs **23** of strip **24**. [For some purposes, the frictional engagement of studs **23** with strip **26** is satisfactory.] One means of more permanent attachment is shown in FIG. 4. A longitudinally extending *edge cover* strip **76** of flexible material covers the exposed edges of sheets **21** adjacent holes **22**. The edges **77** at top and bottom are bent at right angles over the exposed surfaces of strips **24**, **26**. Various means may be used to

bond the edges **77** to strips **24**, **26** as by various adhesives, such as glue **78**. *However, the strip 24 carrying studs 23 and the cooperating apertured strip 26 provide the sheet clamping and binding structure.*

It will be noted that the clamping strips extend along the length of the clamped margin of the book, and are substantially even or flush with the side edge of such clamped margin. Consequently, the strips reinforce and provide a protecting shield for the clamped side edges of the sheets, to prevent tearing or other damage which might otherwise occur by exposed sheet edges rubbing against objects. Furthermore, even though the studs are spaced apart, since they are rigidly secured to one strip and engage in the holes of the other strip, the clamping pressure is distributed uniformly over the entire length of the rigid plastic strips. This results in rigidity against transverse bending of the book in the spaces between the studs, that would otherwise occur if only studs wthout the strips were employed.

FIG. 6 shows a means for cold forming the ends of studs **23**. An attachment indicated generally by reference numeral **81** is connected to press block assembly **56** (see FIG. 2), attachment **81** carrying a plurality of reciprocating punches **82** corresponding in spacing and number to the studs **23**. The outer ends of punches **82** have conical points **83** which penetrate the sheared ends of studs **23** and deform them outwardly. Particularly where holes **27** are formed with counter sinks **28**, such outward deformation locks the sheared ends of studs **23** to strip **26** in permanent fashion. The details of construction of attachment **81** will readily occur to one skilled in this art. Reciprocation of punches **82** may be manually or automatically accomplished by means forming no part of the present invention, the operation being performed after the shear blades **63** have returned to inoperative position.

FIG. 5 shows an attachment **81a** which carries reciprocating hot "Teflon" coated spot welding elements **86** which are heated to about the melting temperature of studs **23**. Contact of such elements **86** with the upstanding ends of studs **23** causes deformation, particularly where the ends of studs **23** have been sheared off a spaced distance above the top of strip **26**. Here again, it is preferable that counter sinks **28** be formed in the top surface of strip **26** *to provide a smooth exposed surface. In this connection, it will be noted that the surface of strip 24 opposite its stud carrying surface is imperforate to provide a smooth nonscratching surface.*

FIG. 7 shows an attachment **81b** which carries a plurality of spinning elements **91**. The spinning of elements **91** causes deformation of the ends of studs **23** particularly when the latter have been sheared off a spaced distance above the top of strip **26**.

It will be understood, of course, that strips similar to strip **76** may be applied to the product after the ends of studs **23** have been deformed as in the manner indicated in FIGS. 5 to 7 or by other means.

In the form of the invention shown in FIGS. 1–15, a bound book formed [comprising] *comprises* a plurality of sheets **21** each formed with a plurality of spaced apertures **22** adjacent one marginal edge of each sheet[.]; *and such sheets are clamped together by a spineless binding consisting of only two components. The first of these components is strip* [Strips] **24** having integral *solid thermoplastic* studs **23** *integral with the strip and projecting upright from one surface of the strip between opposite side edges thereof, thus providing the opposite surface substantially smooth and free of apertures. The surface which has the studs projecting therefrom* [or having separate studs which have been affixed thereto] fits against the outside of the pages **21** on one surface thereof with the studs extending through the holes **22**. *The second binding component is strip* [Strip] **26** *which* fits along the opposite surface of the book thus formed with the studs **23** fitting through the holes **27** and held

therein by friction [or] *and* by deformation of the ends of the studs *to form heads directly in engagement with the side of the strip opposite the sheet side.* FIG. 16 shows a front cover **96** for sheets **21** and a back cover **97**. To facilitate opening the covers, reduced thickness portions **98** may be formed therein adjacent the margins near which holes **22** are located. The covers **96**, **97** are dimensioned at least as large as the sheets **21** and thus resemble conventional book covers. Studs **23a** either formed integrally with cover **96** or are secured thereto in some fashion forming no part of the present invention. Studs **23a** penetrate the holes **22** in pages **21** and also penetrate holes **27a** in cover **97**. The ends of the studs **23a** are sheared off and are secured to the cover **97a** in the same manner as the corresponding elements are secured to the strip **26** in the forms of the invention shown in FIGS. 1–15.

What we claim is:

[1. In combination, a first self-supporting strip having a plurality of studs projecting from one surface thereof, said studs spaced apart in increments, and a second self-supporting strip substantially the same length and width as said first strip formed with apertures spaced apart the same increments as said studs, said apertures dimensioned to receive said studs when said studs are inserted through said apertures, each said strip being formed of extended width and length to comprise a book cover, said strips being totally disconnected from each other except by said studs, said studs formed at their outer ends with heads larger than said apertures to permanently secure said studs to said second strip.]

2. A bound book comprising a plurality of sheets each formed with a plurality of spaced apertures adjacent one margin, *and a binding structure consisting of two components clamping said sheets together, and characterized by the absence of a spine connection between the two components around the spine, one said component consisting of* a first *thermo*plastic *non-resilient* self-supporting, strip underlying one margin on one side of said book and covering said apertures and extending substantially the entire length of said book, *the other said component consisting of* a second [plastic] *thermo-plastic, non-resilient* self-supporting strip overlying one margin of the side of said book opposite said first strip and of a length substantially equal to said first strip *and having stud receiving apertures therein formed with enlargements of said apertures on the outside surface of said second strip;* said strips initially being freely movable toward and away from each other *in infinitely small dimensions* to accommodate a wide *and continuous* range of thicknesses of books, [a plurality of] *said first component further comprising at least three* studs [fixed to] *integrally molded with* said first strip and *projecting from one surface thereof, the opposite surface being imperforate, said studs being smooth and being of uniform cross-section between said strips and* initially of a length greater than the greatest thickness of said range of thicknesses of books, said studs extending through the apertures in said sheets and the apertures in said second strip, said studs sheared close to the surface of said second strip opposite from said sheets and formed with heads larger than said apertures *and substantially filling said enlargements* and permanently secured to said second strip *directly in engagement with the side of said second strip opposite said sheets, said strips at the completion of making said book being the same distance apart as the thickness of said sheets bound between said strips* said strips being totally disconnected from each other except by said studs, *and each said strip being of substantially uniform cross-section and of substantially uniform thickness throughout from end to end.*

3. A book according to claim **2** in which said first strip comprises a first cover and said second strip a second cover for said sheets, said covers dimensioned at least as large as said sheets.

4. A book according to claim 2 which further comprises an edge binding overlapping and adhering to both said strips and the sheared ends of said studs and extending around and covering the edges of said sheets adjacent said one margin.

[5. A book according to claim 2 in which the sheared ends of said studs are distorted to cause said studs to adhere to said second strip.]

[6. A book according to claim 5 in which said studs ends are melted by heat to enlarge the size of said ends.]

[7. A book according to claim 5 in which said stud ends are swaged to enlarge the size of said ends.]

[8. A book according to claim 5 in which said stud ends are spun to enlarge the size of said ends.]

[9. A book according to claim 5 in which the apertures of said second strip are each formed with a countersink on the side of said second strip opposite said sheets and said ends are distorted to fill the countersinks.]

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LAWRENCE CHARLES, Primary Examiner

U.S. Cl. X.R.

11—1; 402—60