Aug. 4, 1959 E. J. SHAPIRO 2,897,504

MACHINES FOR BINDING SHEETS OF MATERIAL

Filed April 19, 1956

FIG. 1

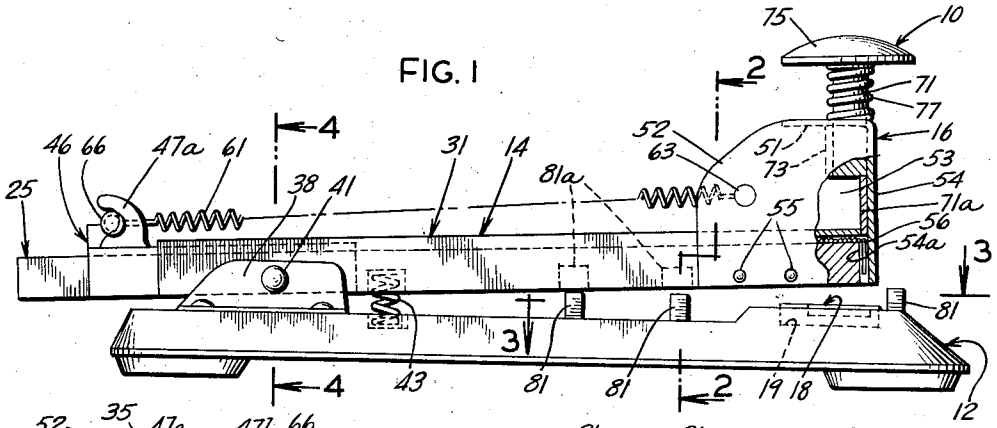


FIG. 2

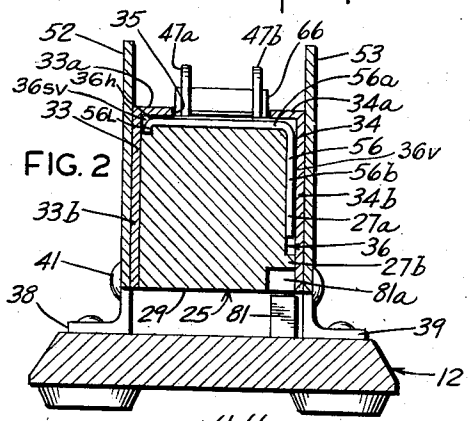


FIG. 3

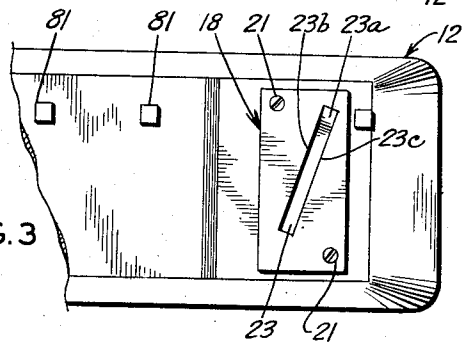


FIG. 4

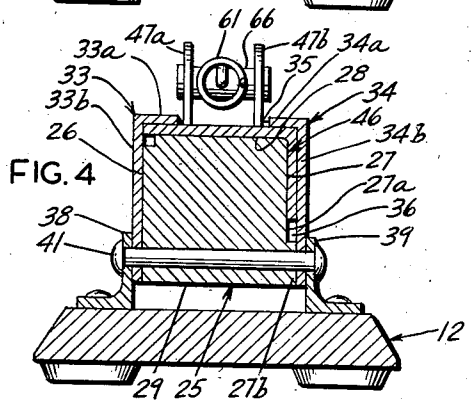


FIG. 5A

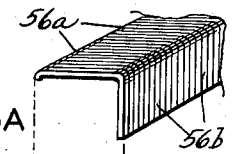


FIG. 5B

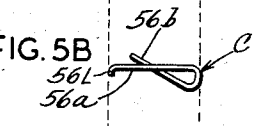


FIG. 5C

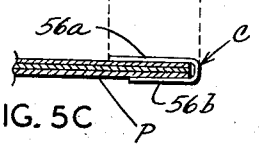
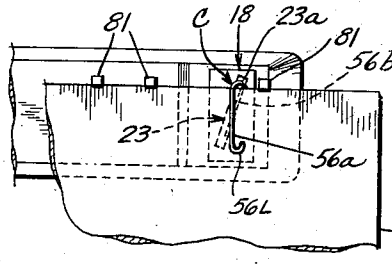


FIG. 6



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MACHINES FOR BINDING SHEETS OF MATERIAL

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4 Claims. (Cl. 1—187)

This invention relates to machines for binding sheets of material together, and more specifically, to machines for securing such sheets together by means of clips which frictionally hold the sheets without perforating the same.

The primary object of my invention is to enable sheets to be secured together in a novel and expeditious manner.

Another object of my invention is to enable novel clips to be applied to sheets in a novel and expeditious manner.

An object ancillary to the foregoing is to enable such clips to be so applied by a machine.

A further object of my invention is to enable wire clips to be applied to stacks of sheets in a novel and expeditious manner so as to effectively clamp such sheets in stacked relation without piercing any of the sheets.

Another object of my invention is to enable novel wire clips to be formed around the edge portion of a stack of sheets in a novel and expeditious manner.

Yet another object of my invention is to enable novel wire clips to be formed in a novel and expeditious manner from a supply of individual pieces of wire which may be arranged in compact relation to each other.

Other and further objects of the present invention will be apparent from the following description and claims and are illustrated in the accompanying drawings which, by way of illustration, show a preferred embodiment of the present invention and the principles thereof and what I now consider to be the best mode in which I have contemplated applying these principles. Other embodiments of the same or equivalent principles may be used and structural changes may be made as desired by those skilled in the art without departing from the present invention and the purview of the appended claims.

In the drawings:

Fig. 1 is a side elevational view of a machine which is constructed, and is operable, in accordance with the principles of my invention;

Fig. 2 is a detail sectional view taken substantially along the line 2—2 in Fig. 1 but omitting the spring 61;

Fig. 3 is a detail plan view taken substantially along the line 3—3 in Fig. 1;

Fig. 4 is a detail sectional view taken substantially along the line 4—4 in Fig. 1;

Fig. 5A is a perspective view of a supply of clip-forming members adapted to be mounted in the machine shown in Fig. 1;

Fig. 5B is a top plan view of a clip formed in accordance with the principles of my invention;

Fig. 5C is a side elevational view of the clip shown in Fig. 5B, showing the clip mounted in operative position on a stack of sheets to be held together; and

Fig. 6 is a detail plan view, similar to Fig. 3, but showing a clip attached to a stack of papers.

A clip-applying machine 10, embodying the principles of my invention, is shown in the drawings to illustrate the preferred embodiment of my invention.

The machine 10 embodies, in general, Fig. 1, an elongated base 12 having an elongated clip magazine 14 pivotally mounted thereon, the magazine 14 having a

head 16 mounted on the front end thereof in overlying position to an anvil 18 mounted on the front end portion of the base 12.

The base 12 may be made of any suitable material such as, for example, steel, and the anvil 18 is preferably mounted in a recess 19 in the front end portion of the base 12, and secured therein by suitable means such as screws 21, Fig. 3. A substantially straight elongated groove or recess 23, having an inwardly and downwardly sloping end portion 23*a* and two substantially straight parallel side walls 23*b* and 23*c* is formed in the upper face of the anvil 18, and extends thereacross at an acute angle to the length of the base 12, in position to dispose the end portion 23*a* forwardly of the other end portion of the recess 23, Fig. 3.

The magazine of the machine 10 includes a substantially straight elongated rail 25 having two side walls 26 and 27, a top wall 28 and a bottom wall 29, Figs. 2 and 4. The top and bottom walls 28 and 29 are disposed in substantially horizontally disposed position and the side wall 26 is preferably substantially straight and is disposed in vertical position between the top wall 28 and the bottom wall 29. The side wall 27 has an inwardly recessed upper end portion 27*a*, and an outwardly projecting lower end portion 27*b* (Figs. 2 and 4).

A hood 31, comprising two elongated substantially inverted L-shaped angle members 33 and 34, is mounted on the rail 25. Each of the angle members 33 and 34 embodies a horizontally disposed top flange 33*a* and 34*a*, and a substantially vertically disposed lower flange 33*b* and 34*b*, respectively. The flanges 33*b* and 34*b* are secured in juxtaposition to the side wall 26 and the lower end portion 27*b* of the side wall 27, respectively, by suitable means such as welding, in position wherein the upper flanges 33*a* and 34*a* project inwardly toward each other in upwardly spaced relation to the top wall 28 of the rail 25. The inner edges of the upper flanges 33*a* and 34*a* terminate in spaced relation to each other to afford an elongated straight trackway 35 therebetween, Figs. 2 and 4. With this construction it will be seen that the hood 31 is disposed in spaced relation to the top wall 28 and the upper end portion 27*a* of the side wall 27 of the rail 25 to thereby afford a channel or guide slot 36 therebetween which is substantially of inverted L-shaped cross section, and which includes an upper horizontal section 36*h*, a long vertical section 36*v* depending at one end of the section 36*h*, and a short vertical section 36*sv* depending at the other end of the horizontal section 36*h*.

The front ends of the rail 25 and the hood 31 terminate in the same vertical plane, but the rear end portion of the rail 25 projects rearwardly from the hood 31, Fig. 1, to facilitate the insertion of clip-forming members into the magazine 14, as will be discussed in greater detail presently.

The rear end portion of the magazine 14 is pivotally mounted on two brackets 38 and 39 projecting upwardly from the rear end portion of the base 12, a pin 41 projecting through the brackets 38 and 39, the rear end portion of the hood 31, and the rear end portion of the rail 25, below the recess 27*a*, for this purpose, Figs. 1 and 4.

A compression coil spring 43 is mounted in a recess 44 formed in the lower face of the rear end portion of the rail 25, forwardly of the brackets 38 and 39, and is disposed in abutting engagement with the upper face of the base 12 to thereby yieldingly urge the magazine 14 to turn in a counterclockwise direction around the pin 41, as viewed in Fig. 1, and normally hold the head 16 and the front end portion of the magazine 14 in raised position relative to the anvil 18 and the front end portion of the base 12.

The head **16** mounted on the front end portion of the magazine **14** embodies a top wall **51** from which depends two substantially parallel side walls **52** and **53**, and a front wall **54** interconnecting the front edge portions of the side walls **52** and **53**. The head **16** is mounted on the front end portion of the magazine **14**, with the side walls **52** and **53** of the head **16** disposed in juxtaposition to the lower flanges **33***b* and **34***b* of the hood **31**, and with the front wall **54** of the head **16** disposed in forwardly spaced relation to the front ends of the hood **31** and the rail **25** to thereby afford a substantially rectangular-shaped channel **54***a* therebetween. The head **16** may be secured in this position by suitable means such as rivets **55** extending through the side walls **52** and **53** and the front end portions of the hood **31** and the rail **25**.

A plurality of substantially inverted L-shaped clip-forming members **56**, Figs. 1 and 5A, made of suitable material such as, for example, steel wire, may be mounted in the channel **36** in the magazine **14** for movement forwardly therealong to the front end of the machine **10**, where they may be successively ejected downwardly through the channel **54***a*, as will be discussed in greater detail presently.

The members **56** have two elongated legs **56***a* and **56***b* which are so positioned relative to each other, that when the members **56** are disposed in the channel **36**, the legs **56***a* thereof may be disposed between the top side **28** of the rail **25** and the upper flanges **33***a* and **34***a* of the hood **31**, and the legs **56***b* thereof may be disposed between the lower flange **34***b* of the hood **31** and the upper portion **27***a* of the side wall **27** of the rail **25**. The members **56** are of such size that they fit relatively snugly in the channel **36**, but are freely slidable therealong. The legs **56***b* of the members **56** are preferably slightly shorter than the legs **56***a* thereof but terminate at their lower ends in upwardly spaced relation to the outwardly projecting lower edge portion **27***b* of the side wall **27** of the rail **25**, when the members **56** are mounted in the channel **36**, Fig. 2. Each member **56** at one end includes a relatively short lip **56**L, Fig. 2, extended generally in the plane of the leg **56***b*, and is adapted to ride in a guide slot of the member **25** opposite the guide slot **36** in which the leg **56***b* rides.

The insertion of the clip-forming members **56** into the channel **36** may be readily accomplished by placing the members **56** on the rear end portion of the rail **25**, rearwardly of the hood **31**, and then sliding the members **56** forwardly into the channel **36**. Although individual members **56** may be used in this manner, I prefer to have the member **56**, to be inserted in my machine, disposed in groups of pre-stacked members **56**, such as shown in Fig. 5A, with the adjacent members **56** attached to each other by readily frangible material such as a thin layer of shellac, or the like.

An elongated slide **46** is provided in my machine **10** for pushing the members **56** along the channel **36**. The slide **46** is substantially L-shaped in cross section, and has two parallel ears **47***a* and **47***b* projecting upwardly therefrom, Figs.1 and 4. The slide is of such size and shape that it may be mounted on the rear end portion of the rail **25** and advanced forwardly therealong through the channel **36**, with the ears **47***a* and **47***b* sliding forwardly through the trackway **35** between the flanges **33***a* and **34***a* of the hood **31**.

An elongated tension coil spring **61** is secured at one end to the head **16** by a pin **63** extending between the side walls **52** and **53**, Fig. 1. A cross-arm **66** is attached to the other end of the coil spring **61** and, when the slide **46** is mounted in the channel **36**, the spring **61** may be stretched rearwardly between the ears **47***a* and **47***b* and releasably secured thereto by disposing the cross arm **66** in abutting engagement with the rear edge portions of the ears **47***a* and **47***b*, Figs. 1 and 2.

The spring **61** is effective to yieldingly urge the slide **46** forwardly on the rail **25** to thereby urge the stack of

members **56** in the channel **36** forwardly toward the front wall **54** of the head **16**.

The width of the channel **54***a*, between the front end of the magazine **14** and rear face of the front wall **54** of the head **16**, is such that a clip-forming member **56** which has been moved along the rail **25** into vertical alignment with the channel **54***a* will not fall by its own weight downwardly through the latter, but may be pushed downwardly therethrough with a relatively light pressure thereon, the sides of the channel **54***a* engaging the sides of the member **56** with a relatively snug sliding fit during such movement.

An elongated plunger **71** having a flat lower end portion **71***a*, which is slightly smaller in cross section than the opening **54***a*, is slidably mounted between a bracket **73** and the front wall **54** of the head **16** for vertical reciprocation therein. An enlarged head or button **75** is mounted on the upper end portion of the plunger **71**, and a compression coil spring **77** is disposed between the button **75** and the top wall **51** of the slide **16**. The plunger **71** is so disposed in the head **16** that the lower end portion **71***a* thereof is normally disposed above the rail **25** and the hood **31**, but, by the application of downward pressure on the button **75**, the plunger **71** may be moved downwardly in a vertical plane so as to move the lower end portion **71***a* thereof downwardly through the opening **54***a* into outwardly projecting relation to the lower faces of the rail **25** and the hood **31**. During such downward movement of the plunger **71**, the lower end portion **71***a* thereof is effective to push the front one of the clip-forming members **56** on the rail **25** downwardly in the same plane in which the plunger **71** moves and through the slot **54***a*.

The anvil **18** is so disposed on the base **12** that when a clip forming member **56** is so moved by the plunger **71**, the lower end portion of the vertical leg **56***b* thereof is moved into abutting engagement with the end portion **23***a* of the groove **23**. This end portion of the groove **23** is aligned in the plane in which the plunger **71**, and the member **56** driven thereby, moves, but the remainder of the groove **23** is angled out of this plane. As the plunger **71** continues to move downwardly the leg **56***a* of the front member **56** is moved downwardly in substantially horizontal disposed position, and is held from turning laterally by the snug engagement in the slot **54***a*. The inwardly sloping end portion **23***a* of the slot **23** cams the lower end portion of the leg **56***b* inwardly and as the plunger **71** continues to move downwardly, the lower end portion of the leg **56***b* moves along the slot **23** in engagement with the side wall **32***c* thereof so that it is moved inwardly under, and transversely across, the leg **56***a*. During this operation, the plunger **71** so compresses the clip-forming member **56** against the anvil **18** with sufficient force that the legs **56***a* and **56***b* thereof are bent take a "permanent set" in the aforementioned overlapped position.

Thus it will be seen that in the operation of my novel machine **10**, a substantially loop shaped clip C, Figs. 5B, 5C and 6, is formed by the downward movement of the plunger **71** toward the anvil **18**, the leg **56***a* of the clip C extending substantially perpendicularly to the length of the base **12** of the machine, and the underlying leg **56***b* being disposed thereacross at an acute angle thereto.

In the operation of my novel machine, papers P, or like sheets of material may be disposed on the base **12** in stacked relation, in position to cover all of the slot **23** except the end portion **23***a* thereof, and with the edge of the stack of sheets which it is desired to secure together preferably disposed in parallel relation to the length of the base **12**, as shown in Fig. 6. Hence, it will be seen that when the plunger **71** is moved downwardly, the lower end portion of the leg **56***b* of the front member **56** in the magazine **14** is moved into engagement with the end portion **23***a* of the slot **23**, and as the leg **56***a* is moved downwardly by the plunger **71** toward longitudinal

juxtaposition with the upper face of the top paper in the stack, the leg 56*b* moves along the slot 23 under the stack of papers so that when the downward movement of the plunger 71 is completed, the clip forming member has been deformed into the aforementioned clip C with the leg 56*a* thereof disposed in overlying relation to the stack of sheets, and the leg 56*b* disposed in underlying relation thereto. The lip 56L in most instances will be merely crushed or bent over but may actually dent the stack of sheets depending upon the thickness thereof.

If desired, upwardly projecting paper stops such as lugs 81 may be afforded on the upper face of the base 12, in such position that the edge of the stack of sheets may be moved laterally across the base 12 into engagement with the lugs 81 in which position the stack of sheets is stopped in the aforementioned operative position wherein the papers cover all of the slot 23 except the end portion 23*a* thereof. Slots 81*a* may be formed in the bottom face of the rail 35 to receive the lugs 81 projecting upwardly from the base 12 rearwardly of the front end of the rail 25, during the downward movement of the magazine 14, in a clip applying operation of my machine.

From the foregoing it will be seen that I have enabled novel fastening members, in the form of clips, to be applied in securing relation to sheets of material in a novel and expeditious manner.

Thus, while I have illustrated and described the preferred embodiment of my invention, it is to be understood that this is capable of variation and modification, and I therefore do not wish to be limited to the precise details set forth, but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. A machine for fastening sheets of material together in a stack comprising a supporting member on which marginal edge portions of said sheets can be placed, means for supporting a substantially inverted L-shaped sheet fastener having a substantially horizontal leg and a substantially vertical leg having a free end above said supporting member, means movable in a vertical plane for moving such an inverted L-shaped fastener downwardly from said first mentioned means in said plane and onto said supporting member, a single clinching groove provided on said supporting member and disposed at an angle relative to said plane for moving said vertical leg into transversely underlying relation to said horizontal leg during said downward movement of said inverted L-shaped member to clamp together inner edge portions of sheets on said supporting member, said groove including a cam portion at one end aligned in said plane and initially engageable by the free end of said vertical leg during commencement of transverse movement thereof, and sheet aligning means on said supporting member to locate the inner edges of said sheets to be clamped in spaced relation to said cam portion to enable the free end of said vertical leg to clear the inner edge portions of the sheets to be clamped without penetrating the sheets.

2. In a machine for fastening sheets of material together in a stack, the combination of a supporting member having an area for receiving the edge portion of such a stack thereon, means for supporting a plurality of substantially inverted L-shaped sheet fasteners disposed in side-by-side relation to each other and in substantially upright position above said supporting member with a first leg thereof disposed vertically and a second leg thereof disposed horizontally, a single elongated clinching groove provided on said support member and arranged to extend at an angle relative to said second leg of a fastener disposed as aforesaid, said groove including a cam portion at one end engageable by an end of the first leg of the fastener and configured to direct the first leg of the fastener inwardly along the path defined by said groove and at an angle to the second leg of the fastener, means movable in a vertical plane for forcing individual ones of said fasteners downwardly into engagement with said cam portion so as to thereby cause the first leg of said fastener to move along said groove and into transversely underlying relation to the second leg of said fastener to clamp sheets on said support about the inner edges thereof, said groove being disposed at an angle relative to said vertical plane and said cam portion being aligned in said plane, and aligning means for said sheets inwardly of said cam portion to position the sheets with the inner edge portions thereof to be clamped above said groove and clear of said cam portion.

3. In a machine for fastening a stack of sheets of material together by a fastener clamped about edge portions thereof, the combination of a supporting member for a fastener having two elongated legs, said legs being connected at their adjacent ends in substantially perpendicular relation to each other and disposable on said supporting member with one of said legs in substantially vertically extending position and the other of said legs projecting substantially horizontally from the upper end of said one leg, a plunger movable in a vertical plane for applying a downward force to said other leg to move the fastener downward in said plane, an anvil on which said sheets can be positioned, and means arranged in a fixed position on said anvil below said supporting member and defining a single clinching groove engageable by the free lower end of said one leg and extended at an angle to said plane to bend said one leg into underlying relation to said other leg in transverse relation thereto upon a downward force applied to said other leg by said plunger.

4. In a machine for fastening a stack of sheets of material together, the combination of a supporting member for a fastener having two elongated legs, said legs being connected at adjacent ends in substantially perpendicular relation to each other and disposable on said supporting member so that one of said legs is disposed in substantially vertically extending position and the other of said legs projects substantially horizontally from the upper end of said one leg, a plunger arranged for movement in a vertical plane and having a flat free edge engageable with said other leg for moving said fastener downwardly in said plane from said supporting member, an anvil below said supporting member and on which the sheets can be positioned, a single fixed clinching groove provided on said anvil and arranged at an angle relative to the plane in which said plunger moves, and said groove having a cam surface at the inner end thereof and which cam surface is aligned in said plane so as to be initially engageable by the free end of said one leg and which is configured to bend the one leg inwardly along said groove during said downward movement of said fastener in said plane.

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