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METHOD OF AND MACHINE FOR STAPLING OR STITCHING

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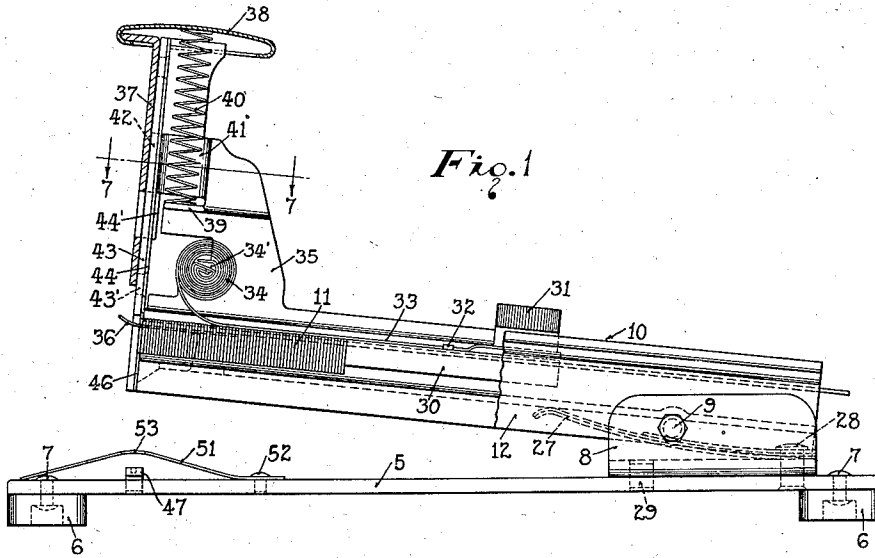


Fig. 1

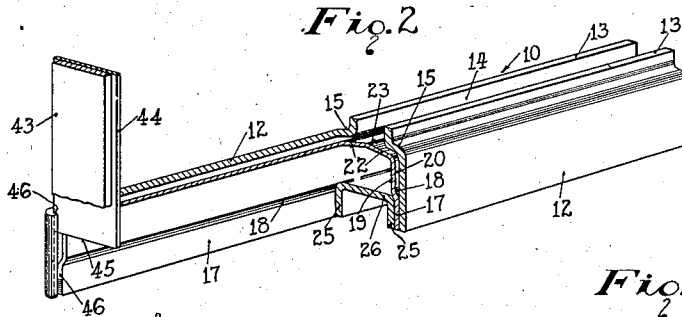


Fig. 2

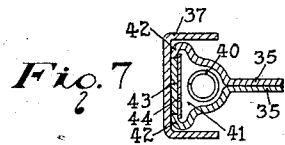


Fig. 7

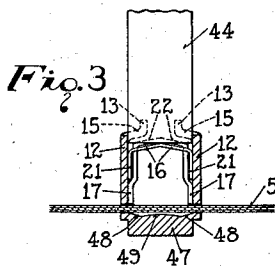


Fig. 3

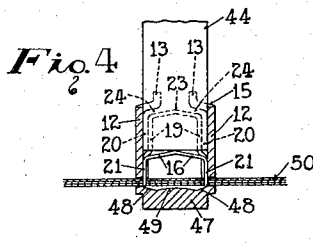


Fig. 4

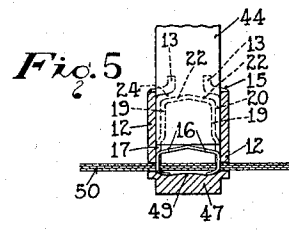


Fig. 5

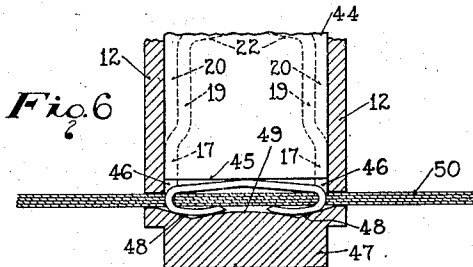


Fig. 6

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# UNITED STATES PATENT OFFICE

2,055,249

## METHOD OF AND MACHINE FOR STAPLING OR STITCHING

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Application December 27, 1933, Serial No. 704,112

13 Claims. (Cl. 1—3)

This invention relates to a method of, and machine for, stitching or stapling and, while capable of general use, is particularly adapted for use in stapling in objects or materials or stitching or stapling together sheets or layers of paper or other materials.

It has heretofore been proposed to provide stitching or stapling machines, manually or otherwise suitably operated, embodying means for storing and feeding a strip of detachably connected, straight-topped preformed staples; means for separating and driving them, one after another, into juxtaposed sheets of material; and means for clinching each driven staple to form a fastening means. A machine of this type is disclosed in Patent Number 1,506,073 granted August 26, 1924, to A. H. Maynard and while machines of this type and others similar thereto for driving, but not clinching, the staples have been generally efficient and in great demand, it sometimes happens that in their operation the staples will buckle, bend or jam so that they either cannot be driven into the object or material or, if driven thereinto, they form imperfect stitches or fasteners. These difficulties are in most cases due either to buckling of the straight tops of the staples which causes the legs thereof to bend or buckle or to application of the driving force on said legs only which sometimes causes them to bend or buckle and occasionally become detached from the straight tops of the staples.

One object of the present invention is to provide a method of, and machine for, driving staples which overcomes the above mentioned disadvantages and enables feeding and driving of the staples to be accomplished with greater efficiency and economy.

Another object of the present invention is to provide a method of, and machine for, driving staples which enables the driven staples to be readily withdrawn or extracted if so desired.

Another object of the present invention is to provide a method of, and machine for, driving staples which enables the production of fasteners with crowned portions laying close to the stapled object or material but sufficiently raised or crowned to enable a tool to be placed under any of the fasteners to withdraw or extract the same.

Another object of the present invention is to provide a method of, and machine for, stitching or stapling which produces stitches or fasteners having tops or heads substantially flush with the stitched or stapled sheet or other assembly but sufficiently crowned to enable said stitches or

fasteners to be readily withdrawn or extracted if so desired.

Another object of the present invention is to provide a method of, and machine for, driving staples which effects guiding of the legs of the staples and application and production of forces thereon in such manner that the legs are firmly held in proper position for driving and prevented from buckling inwardly or outwardly upon contact with objects or materials and while being driven thereinto.

Another object of the present invention is to provide a method of, and machine for, stapling or stitching together sheet materials which prevents buckling of the legs of the staples when they are engaged with and being driven through the materials and insures neat and efficient securing or clinching of the stitches or staples thereagainst.

Another object of the present invention is to provide an improved metallic stitch for securing objects or materials together and which can be readily extracted or withdrawn therefrom if so desired.

Another object of the present invention is to provide an improved assembly of objects or materials stitched or fastened together with wire or other material in such manner as to enable the stitches or fasteners to be readily withdrawn or extracted if so desired.

These and other objects of the present invention will appear from the following description thereof, and in order to more clearly understand the invention reference may be had to the accompanying drawing which illustrates the manner of carrying out the method of said invention and one mechanical embodiment thereof.

In said drawing:—

Fig. 1 is a side elevation of a hand-operated stitching or stapling machine including a clinching anvil;

Fig. 2 is a fragmentary detailed perspective view, partly in section, of the staple magazine, support, and driver shown in Fig. 1;

Figs. 3, 4 and 5 are fragmentary transverse vertical sectional views of said machine showing the staple magazine, support, and clinching anvil and illustrating successively different positions of the driver and different steps of the present method;

Fig. 6 is an enlarged fragmentary transverse vertical sectional view similar to Fig. 5, but showing the driver in a different position and illustrating the final step of said method; and

Fig. 7 is a transverse horizontal sectional view on the line 7—7 of Fig. 1.

Referring to the drawing, wherein like reference characters designate like parts throughout the several views, the machine of the present invention may receive a variety of mechanical expressions, and the method of said invention may be carried out in these or various other types of equipment. As herein disclosed, however, the machine of said invention by which the method thereof may be carried out is of the type illustrated in Patent Number 1,506,073 above referred to. Accordingly, in Fig. 1 of the drawing 5 indicates a flat base formed of metal or other suitable material and provided at its opposite ends with feet 6 of rubber or the like which are riveted or otherwise suitably secured, as at 7, to said base. Riveted or otherwise suitably secured to one end of the base 5 is a U-shaped yoke 8 in which is pivotally mounted, as at 9, an arm that is indicated generally at 10. In accordance with the present invention the arm 10 is formed and constructed to provide a magazine and a support for preformed staples 11 of the type disclosed in my copending application Serial Number 704,114, filed December 27, 1933, and which have truss-like crowns.

Accordingly, the opposite sides of the arm 10 are comprised by plates 12 of metal or other suitable material bent or otherwise suitably shaped to provide, at the tops thereof, spaced vertical flanges 13 forming a channel 14 and connected with said plates by upwardly and inwardly inclined webs 15 formed to fit the inwardly and upwardly inclined portions 16 of the truss-like crowns of the staples 11, as hereinafter described. Secured to the side plates 12 interiorly thereof, as by spot welding or other suitable means, are the lower vertical and longitudinally-extending portions 17 of an inverted, substantially U-shaped core or staple supporting and guiding bar. The opposite sides of the bar are bent, as at 18, to provide similar portions 19 spaced from said side plates and forming therewith guide channels 20 for the legs 21 of the staples 11. This staple supporting and guiding bar 15 is provided along the top thereof with staple crown-supporting portions 22 inclined downwardly and outwardly from the longitudinally extending peak 23 of said bar toward the side plates 12 and providing, with the webs 15, guide channels 24 for the inclined portions 16 of the truss-like staple crowns.

Within the staple-supporting and guiding bar or core is a reinforcing and spacing bar 26 of inverted U-shape which extends longitudinally of the arm and has vertical depending flanges 25 spot welded or otherwise suitably secured to the inner side portions 17 of the bar or core. The pivot 9 for the arm 10 extends through suitable openings in said flanges 25 and the portions 17 of said staple-supporting and guiding bar. The webs 15 and the staple-supporting surfaces 22 are disposed in spaced parallel relationship, and while the inclination thereof may vary under certain circumstances the space between the opposed surfaces substantially equals the diameter or thickness of the wire or other material of which a staple such as indicated at 11 is made. Accordingly, the depth of the channels 24 is substantially equal to the thickness of said material.

The arm 10 is normally held in raised inoperative position, as shown in Fig. 1, by a leaf spring 27 which extends longitudinally of the bar 26 between the side flanges 25 thereof. This leaf spring 27 has one end secured to the yoke 8 by a rivet 28 which, together with a pin or rivet 29,

serves to hold said yoke on the base 5 of the machine. The arm or staple magazine 10 is open at the rear to receive the staples 11 therein and during operation of the machine said arm or magazine is pressed downwardly against the action of spring 27 and then returned thereby to its inoperative position when released. The machine, in addition to the arm or staple magazine 10, includes staple-feeding means, staple-driving means, and staple-clinching means, and these instrumentalities will be described in the order named, being preferably constructed, arranged, and operated as next described.

The staple-feeding means comprises a channel-like follower or staple-pusher 30 shaped in conformity with the portions 19 and 22 of the staple supporting and guiding bar and slidably mounted thereon in the channels 20 and 24. This follower 30 has a knob or handle 31 riveted or otherwise suitably secured thereto which projects upwardly beyond the arm or magazine 10 through the channel 14 in the top thereof. A spring 33 has one end secured to the follower 30 by the knob 31 and a fastener 32. The spring 33 extends along the channel 14 and includes a coil 34 at its opposite end fixedly mounted, as at 34', between brackets 35 in a suitable opening formed therein. The brackets 35 are secured to, or formed integrally with, the side plates 12 of arm 10 and extend upwardly therefrom at the fore part thereof. The staples 11, as clearly shown in Fig. 1, are positioned in the arm or magazine 10 forwardly of the follower 30, and the coil 34 of the spring 33, being connected as before described with said follower, causes the latter to feed the staples 11 forwardly step by step toward the staple driving means in the fore part of the machine as the staples are separated from the strip thereof and driven by said staple-driving means. A leaf spring 36, riveted or otherwise suitably secured to the bar 26, projects a short distance beyond the front thereof, as shown in Fig. 1, and serves as a supporter to hold the foremost staple in proper position for operation thereupon by the driving means.

The staple driving means comprises a plunger 37 slidably mounted on the brackets 35 at the forepart of the machine for reciprocating movement along a path extending at right-angles to the path of movement traversed by the staples 11 toward said driving means. The plunger 37 is provided at its top with an operating handle or knob 38, and a coiled spring 40 is interposed between the knob and lugs 39 of the bracket 35. The spring 40, through expansion thereof, normally holds the plunger 37 in the raised inoperative position thereof shown in Fig. 1, but is compressed when, through application of pressure downwardly on the knob or handle 38, the arm or magazine 10 is swung downwardly and the plunger 37 is thereafter actuated.

The upper portions of the brackets 35 are formed to provide a substantially circular two-part housing 41 for the lower part of spring 40 and the parts of said housing, in turn, are formed to provide guides 42 for a plate 43. A staple-driver 44 is riveted or otherwise suitably secured to the plate 43, as at 43', the staple-driver 44 being somewhat wider than the plate and made of hardened steel or the like. The plate 43 is secured to the front of the plunger 37 interiorly thereof by a clamp 44' formed on said head from material stamped therefrom. The staple-driver 44 is provided at its lower extremity with a straight-edged driving end 45 extending at right

angles to the vertical edges of said driver. The driver 44, through the described connections thereof with the plate 43, serves to hold the latter and the plunger 37 in position on the guides 42.

The driver 44 is slidably mounted in guides 46 (Figs. 2 and 6) or narrow grooves formed in the forward end portions of the side plates 12 and extending at right angles to the path of movement traversed by the staples 11 toward the staple-driving means. The foremost staple of the strip or supply in the arm or magazine 10 is disposed in the guides 46 and also travels downwardly along said guides when separated from said strip or supply and driven by the staple-driving means. In accordance with the present invention, the length of the driving stroke of the driver 44 is such that when it is completed a space substantially equal to the diameter or thickness of the wire or other material of a staple, such as indicated at 11, is left between the inner point of the peak of the crown of the staple and the object or material into which the staple is driven by said device. A withdrawing tool or the like may then be inserted in said space to remove or extract the staple if desired. Accordingly, the downward or operating stroke of the driver 44 is terminated in the guides 46 a distance from the bottom of the latter and the lower edges of the plates 12 which is substantially equal to twice the thickness of the material of staples such as indicated at 11. For this purpose the clamp 44' is so formed and positioned on the plunger 37 that during downward movement of said plunger said clamp strikes the top of the arm or magazine 10 and thus limits the downward movement of the driver 44 as aforesaid.

The staple-clinching means comprises an anvil 47 which is riveted or otherwise suitably secured to the base 5 of the machine forwardly thereof at a point in vertical alignment with the driver 44 when the arm or magazine 10 and the plunger 37 are depressed to their full extent. The anvil 47 is made of hardened steel or other suitable material and formed transversely with a groove comprising downwardly and inwardly inclined portions 48 terminating at the outer lower extremities of a convex portion 49 and serving therewith to bend the legs of the staple and clinch said legs under layers of material 50 when they are driven therethrough. A bent plate 51, of spring metal or the like, serves to hold the work raised above the anvil 47 until the legs of the staple are driven completely therethrough as explained in U. S. Patent No. 1,506,073 previously referred to. The plate 51 has one end riveted, as at 52, to the base 5. The opposite end of plate 51 slidably engages the forward part of base 5 and said plate is provided with an enlarged opening 53 through which the stitching or stapling operation is performed.

The follower 30 is moved rearwardly out of the machine against the action of coil 34 by means of the knob or handle 31, in order to load or store the strip or strips of preformed, detachably connected crowned staples 11 in the arm or magazine 10. Loading of said magazine is then accomplished by moving said staples into the magazine through its rearward open end. When the staples have thus been placed in the arm or magazine 10 their inclined, crowned portions 16 rest on and are supported by the inclined surfaces 22 of the staple-core. The legs 21 of the staples extend in the channels 20. During feeding of the staples by follower 30 they are guided

along the surfaces 22 and the channels 20 and 24, and through the configuration thereof are retained against lateral and upward displacement therefrom.

The staples 11 having been placed in the arm or magazine 10, the follower 30 is repositioned therein back of said staples so that the foremost staple is, through the action of the supporter actuated follower 30, brought up over the spring 36 into the guides 46 and under the raised staple-driver 44. The machine is then ready for operation to carry out the present method. Accordingly, the sheets or layers 50 of material are placed on the yieldable plate 51 under the normally raised staple driving means and the arm or magazine 10 is depressed by the knob or handle 38 to carry it downwardly toward the work and into engagement therewith as shown in Fig. 3. In this initial operation of the machine the foremost staple 11, through slight downward movement of the driver 44 and engagement of its straight-edged end 45 with the peak of the staple crown, is separated from the strip of staples in the arm or magazine 10 and forced downwardly to a position approximating that shown in Fig. 3 of the drawing. By reference to this view of the drawing it will be noted that in this position of the staple the legs 21 thereof have moved downwardly along the guides 46 and the crown of the staple has likewise moved downwardly beyond the forward end of the staple supporting and guiding bar which, together with said guides, now holds the staple in said position.

Upon continued downward movement of the staple driver 44 the staple is engaged with the work 50 at the top thereof, whereupon the driving force applied on the peak of said staple causes the inclined crown portions 16 thereof to be slightly deformed or depressed. The driver 44 thus creates pressure or forces applied to the legs 21 of the staple from the inner sides thereof which tends to spread them outwardly and firmly against the exterior staple leg confining guides 46. The legs 21 of the staples are thus supported on both sides thereof, being prevented from buckling outwardly or inwardly, and firmly held against the guides 46 in proper position for driving through the work 50, as illustrated in Fig. 4 of the drawing. Continued application of driving force downwardly on the peak of the staple crown drives the staple legs through the work 50 and causes the portions of the staple legs which have passed through the work to engage the anvil 47 in the transverse groove thereof and be bent inwardly toward each other against the under side of the work, as shown in Fig. 5 of the drawing.

The staple-driver 44 then continues downwardly to the limit of its driving stroke, as shown in Fig. 6 of the drawing, so that the lower straight-edged end 45 of the driver is disposed in the guide 46 a distance from the bottom thereof substantially equal to twice the diameter or thickness of the staple material, as previously set forth. The inner point of the peak of the staple crown is thus disposed above the top of the work 50 a distance substantially equal to the diameter or thickness of the staple material, the crown of the staple as a whole being substantially flush with one side of the work 50, but sufficiently raised to enable a tool to be inserted thereunder to withdraw or extract the staple if desired. The legs of the staple are, through the final downward movement of the driver, bent by the anvil 47 and the driver 44 into the positions substan-

tially as shown in Fig. 6, it being noted that the bent ends of the staple legs 21 extend close to the under side of the work 50 in engagement therewith and thus provide a substantially flat and highly efficient clinching of the staple or fastener.

It will appear from the foregoing that the present invention provides a method of, and machine for, stapling with or without clinching of the staple legs, as desired, and which in either case insures that the staple legs, through the exterior and interior support thereof afforded by guiding them on one side and applying pressure or forces thereon from the opposite side, will not bend or buckle when contacting the object or material and being driven thereinto or there-through. It will also appear from the foregoing that the present invention provides a method of, and machine for, stapling which insures that the staples, during feeding as well as driving will always be held firmly in proper position.

It will further appear from the foregoing that the present invention provides a method of, and machine for, stapling, with or without clinching of the staple legs, as desired, and which in either case insures the production of neat and efficient stapling or stitching of close proximity to the objects or materials and yet sufficiently raised or crowned to enable the staples, fasteners or stitches to be readily withdrawn or extracted therefrom if so desired.

While the present invention, both as respects the machine and method of operation thereof, has been described and illustrated in the present disclosure with more or less particularity, it is to be expressly understood that said invention is not limited to said disclosure or otherwise than by the appended claims.

What I claim is:

1. In a machine of the character described, means for holding and guiding a strip or supply of crowned staples and provided longitudinally with angularly related surfaces adapted to engage inclined crowned portions of the staples, mechanism for driving the staples including a driver mounted for reciprocating movement and having a straight-edged driving end, and means for feeding the staples along said first named means toward said mechanism.

2. In a machine of the character described, means for extending through a strip or supply of crowned staples and provided longitudinally with angularly related surfaces adapted to engage inclined crown portions of the staples from the interior thereof, angularly related retaining means for extending over and engaging said inclined crown portions of the staples exteriorly thereof, mechanism for driving the staples including a driver having a straight-edged driving end, and devices for feeding the staples along said means toward said mechanism.

3. In a machine of the character described, means for holding a strip or supply of preformed crowned staples and provided longitudinally with angularly related surfaces adapted to engage inclined crowned portions of said staples, guide means extending transversely of the staple-holding means and into which the staples are fed therefrom, mechanism for driving the staples including a driver mounted for reciprocating movement in the guide means and having a straight-edged driving end for engagement with the peak of the crown of each staple driven thereby, and means for feeding the staples along said holding means to said guide means and said mechanism.

4. In a machine of the character described, means for holding a strip or supply of preformed crowned wire staples and provided longitudinally with angularly related surfaces adapted to engage inclined crowned portions of the staples, guide means extending transversely of the holding means at one end thereof and into which the staples are fed, a clinching anvil disposed opposite the guide means in spaced relation therewith, mechanism for driving the staples including a driver mounted for reciprocating movement in the guide means toward and away from said anvil, said driver having a straight-edged driving end for engagement with the peak of the crown of each staple driven thereby and clinched by said anvil, and means for feeding the staples along said holding means to said guide means and said driver.

5. In a machine of the character described, means for holding a strip or supply of preformed crowned wire staples and provided longitudinally with angularly related surfaces adapted to engage inclined portions of the staples interiorly and exteriorly thereof, mechanism for separating a staple from the supply and driving it into an object or material to leave a space between the latter and the inner side of the peak of the staple crown, and means for feeding the staples along said holding means to said mechanism.

6. In a machine of the character described, means for holding a strip or supply of preformed crowned wire staples comprising a core, and a casing spaced from the core, said core and casing enclosing the staples and having inclined faces engaging the inclined crowned portions of the staples interiorly and exteriorly thereof, guide means into which the crowned staples are fed, means for feeding the staples along said holding means into the guide means, and mechanism for driving the staples of said strip or supply through said guide means into objects or materials, said mechanism including a staple-driver having a straight-edged driving end and movable along the guide means into engagement with the crown of a staple therein, and a rearwardly extending projection carried by said driver for engaging the casing whereby the driving stroke is terminated to leave a space between the inner side of the crown of each driven staple and the object or material into which it is driven.

7. In a machine of the character described, means for holding, guiding and retaining a strip or supply of preformed crowned staples and provided longitudinally with angularly related surfaces adapted to engage inclined crowned portions of the staples interiorly and exteriorly thereof, mechanism for driving staples through sheet materials and clinching the staple legs thereagainst, said mechanism including an anvil, means for feeding the staples along said first-named means to the staple driving mechanism, and a staple-driver forming part of said mechanism, said staple driver having a straight-edged driving end and being movable toward and away from the anvil to drive a crowned staple through the materials, clinch it thereagainst, release the stapled materials, and leave a space between said materials and the inner side of the crown of said staple.

8. In a machine of the character described, means for holding a strip or supply of preformed crowned wire staples and provided longitudinally with angularly related surfaces inclined toward opposite sides of the machine and adapted to engage inclined crowned portions of said staples, 75

mechanism for driving staples through sheet materials and clinching the staples thereagainst, said mechanism including an anvil, means for feeding the staples along the holding means toward the staple-driving mechanism, guide means extending transversely of the holding means toward the anvil and into which the staples are fed by the staple feeding means, and a staple-driver forming part of said mechanism, said staple driver having a straight-edged driving end and being movable in the guide means toward and away from the anvil to drive a staple through the materials, clinch it thereagainst, release the stapled materials, and leave a space between the latter and the inner side of the crown of said staple.

9. In a machine of the character described, substantially horizontal means for holding a strip or supply of preformed crowned wire staples and provided longitudinally with angularly related surfaces inclined downwardly and outwardly toward opposite sides of the machine and adapted to engage inclined crowned portions of the staples interiorly and exteriorly thereof, mechanism for driving staples through sheet materials and clinching the staple legs thereagainst, said mechanism including an anvil disposed below the staple-holding means in spaced relation with one end thereof, staple-guiding means at said end of the staple holding means and extending transversely thereof, means for feeding the staples along the staple-holding means into the staple-guiding means, means pivotally mounting said staple-holding means for swinging movement of the same and the guiding means toward and away from the anvil, a staple driver forming part of said mechanism and mounted for reciprocating movement in the staple-guiding means to drive a staple through the material, clinch it thereagainst, and release the stapled materials, said staple-driver having a straight-edged driving end for engagement with the peaks of the staple crowns, and means for limiting the driving stroke of said driver to leave a space between said materials and the inner side of the peak of the crown of each staple driven therein and clinched thereagainst.

10. In a machine of the character described, means adapted to support a strip or supply of crowned staples and provided longitudinally with angularly related surfaces adapted to engage inclined crowned portions of the staples from the interior thereof, angularly related retaining means for extending over and engaging said inclined crowned portions of the staples exteriorly thereof, mechanism for driving the staples including a driver mounted for reciprocating movement, means for feeding the staples along said first-named means toward said mechanism, and

means for limiting the driving stroke of the driver whereby it is terminated to leave a space between the crown of each driven staple and the object or material into which it is driven.

11. In a machine for applying crowned staples of the type having a central apex and straight portions inclined downwardly and outwardly to its legs comprising mechanism for driving the staples through the work and clinching the legs of the staple thereagainst, said mechanism including an anvil, a magazine arm for holding and feeding the staples to the staple-driving mechanism, a core in said magazine arm for supporting the staples, said core having a raised longitudinally-extending peak for engaging the apex and side portions for engaging the inclined sides of the crowned head adjacent the legs, a staple-driver having a straight-edged driving end, means for limiting the movement of the staple-driver to leave a space between the apex of the driven staple and the work, and means for feeding the staples along the core in the magazine arm toward the staple-driver.

12. The method of stitching and stapling together sheets of material or the like with crowned staples of the type having a central apex and straight portions inclined downwardly and outwardly to its legs which comprises applying a driving force on the apex only of the crown of said staple to tend to spread its legs and prevent them from bending inwardly, supporting said legs against outward lateral movement while the staple is being driven, limiting the application of the driving force with respect to the work to leave a space between the apex of the crowned head of the staple and the work, and simultaneously clinching the legs of the staple against the bottom of the work while the staple is being driven.

13. The method of stitching and stapling together sheets of material or the like with wire staples of the type having a crowned head forming angular corners at its points of joinder with the parallel leg portions which comprises applying a driving force at a single point on the crowned head of the staple to tend to spread the legs due to the angular relation of the head with respect to the legs to thereby prevent them from bending inwardly, supporting said legs against outward lateral movement while the staple is being driven, continuing the application of the driving force until the angular corner portions of the crowned head engage the material being stitched to leave a space between the apex of the crowned head of the staple and the material, and simultaneously clinching the legs of the staple against the bottom of the work while the staple is being driven.

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