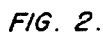
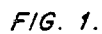


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2 Sheets-Sheet 1



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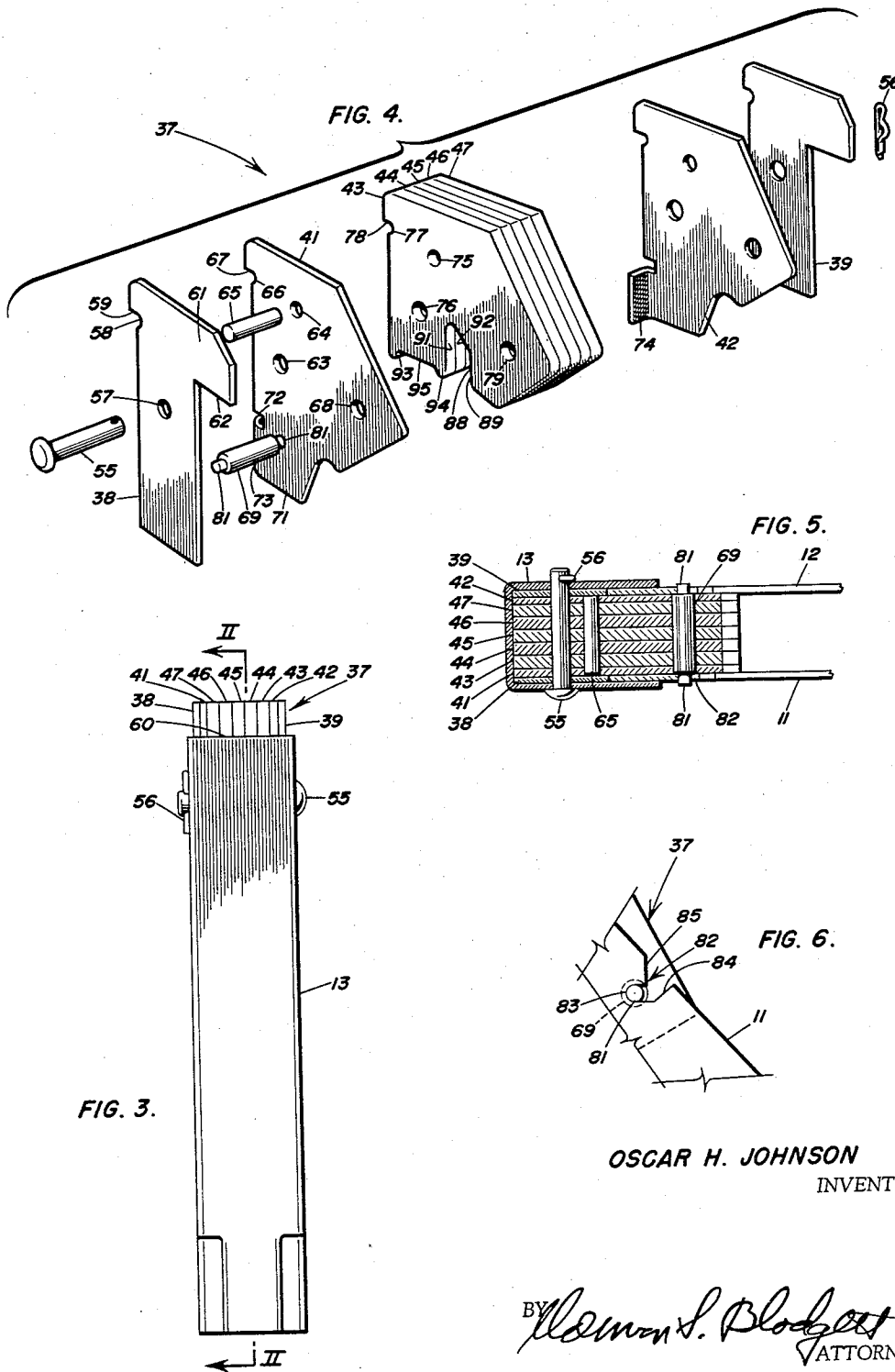
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STAPLER

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STAPLER

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This invention relates to a stapler and, more particularly, to apparatus arranged to drive wire staples for fastening and like purposes.

According to common practice, staplers and stapling guns are provided with a spring-loaded hammer which drives a wire staple. The hammer is retracted against spring pressure by a hammer lifter which, at the upper end of the retraction stroke, engages a cam surface on a cap piece. This cap piece also serves to abut one end of the spring. Because of its complicated configuration, the cap piece is difficult to manufacture and is subject to rapid wear. Also, the spring is the part of the stapler that is most liable to breakage and, yet, the known stapler constructions do not permit ready replacement of the spring. These and other difficulties experienced with the prior art devices have been obviated by the present invention in a novel manner.

It is, therefore, an outstanding object of the invention to provide a stapler which is capable of extremely long life and in which parts most likely to be damaged may be readily replaced.

Another object of this invention is the provision of a stapling gun having a wear-resistant cap member.

A further object of the present invention is the provision of a stapling apparatus with a cam and spring-retaining means of complicated configuration which is readily manufactured from sheet metal stampings.

It is another object of the instant invention to provide a stapler having a readily removable cap member.

It is a further object of the invention to provide a stapler having a means of engagement between the hammer and the retractor which permits accurate release and minimum wear.

A still further object of this invention is the provision of a stapler having a novel spring-retaining means.

With these and other objects in view, as will be apparent to those skilled in the art, the invention resides in the combination of parts set forth in the specification and covered by the claims appended hereto.

The character of the invention, however, may be best understood by reference to one of its structural forms, as illustrated in the accompanying drawings in which:

FIG. 1 is a side elevational view of a stapler embodying the principles of the present invention,

FIG. 2 is a vertical sectional view of the stapler taken on the line II-II of FIG. 3;

FIG. 3 is an end elevational view of the stapler;

FIG. 4 is an exploded perspective view of a portion of the stapler;

FIG. 5 is a horizontal sectional view of the stapler taken on the line V-V of FIG. 2; and

FIG. 6 is a somewhat enlarged view of a portion of the invention.

Referring first to FIG. 1, which best shows the general features of the invention, the stapler, indicated generally by the reference numeral 10, is formed with two spaced parallel side frames 11 and 12 which are embraced along corresponding normally-vertical straight edges by a U-shaped front frame 13. The side frames are held in spaced parallel relationship by a frame channel 14 running along corresponding bottom edges. Bumper retainers 15 are also located between the side frames and the unit is provided with a base 16. A staple guide 17

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is located within the frame channel 14. A plastic handle 18 is located between the side frames. An actuating handle 19 is pivoted between the side frames on a pivot pin 21 and a shield 22 is mounted on the handle. A lock loop 23 is pivoted on the side frames and is adapted to engage a slot 24 formed in the handle. A hammer 25 is located between the side frames within the front frame 13 and is provided with a staple blade 26 fastened thereto and resting against the bight of the U-shaped front frame 13. A spring guide roller 27 is mounted within the staple guide 17 and is rotatably mounted on a spring guide roller pin 28. A hammer lifter 29 is mounted on a pivot pin 31 as a lever between the side frames 11 and 12 and between downward-depending flanges formed on each of the side frames by means of a pivot pin 34. A staple-pressure slide 32 is mounted in the staple guide 17. The slide 32 is fastened within the frame channel 14 by means of slide rivets 35. A hammer spring 36 rests in an upwardly-directed recess in the top of the hammer 25. Between the side frames 11 and 12 and within the front frame 13 is also mounted a cap member 37 consisting of outside laminations 38 and 39 within which are provided spring-confining laminations 41 and 42. Finally, five lifter cam laminations 43, 44, 45, 46, and 47 are located between the spring-confining laminations 41 and 42. A latch spring 48 is associated with the latch 33, while a lifter spring 49 is mounted on a pivot pin 51 in the handle 19. A staple feed spring 52 is mounted within the staple guide 17 and has one end attached to a hinge pin 53 while the other end is attached to the slide 32. A rubber bumper 54 is mounted on the upper side of the frame channel 14 and underlies the hammer 25.

A rivet 55 extends through the side flanges of the front frame 13 and through corresponding apertures in all of the laminations. At one end, the rivet is provided with an aperture through which extends a lock spring 56 of a well-known type.

As is evident in FIG. 4, the two laminations 38 and 39 of the cap 37 are exactly alike, the lamination 38 being provided with an aperture 57 to receive the rivet 55. It is formed with a notch 58 having a downwardly-directed edge 59 which engages and rests on the upper edge 60 of the bight of the channel-shaped front frame 13. It is provided with a rearwardly-directed abutment 61 having a downwardly-directed edge 62 which rests on an upper horizontal edge of the side frame 11 (see FIG. 1). The spring-confining laminations 41 and 42 are mirror images of one another. The lamination 41 is provided with an aperture 63 adapted to receive the rivet 55 and an aperture 64 is adapted to receive a rivet 65 which holds the laminations 41, 42, 43, 44, 45, 46, and 47 together as a unitary body. It is also provided with a notch 66 defining a downwardly-directed edge 67 similar to the edge 59 of the lamination 38; the edge 67 rests on the upper edge 60 of the bight of the front frame 13. The lamination 41 is also provided with an aperture 68 for receiving a pivot pin 69, as will be described more fully hereinafter. The lamination 41 is provided with a downwardly-directed leg 71 having a notch 72 along one edge. The portion of the leg 71 underlying the notch 72 is bent to provide a curved portion 73 which extends inwardly of the stapler. The lamination 42 is similar to the lamination 41 but is provided with a curved portion 74 which is curved in the opposite direction, i.e., toward the lamination 41. The outer vertical edges of the curved portions 73 and 74 are located adjacent one another and the two curved portions form a generally tubular construction which embraces the top of the spring 36. The lifter cam laminations 43, 44, 45, 46, and 47 are all exactly alike and are stamped out of thin sheet metal, as are all the lamina-

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tions for that matter. The lamination 43 is typical of the lifter cam laminations and is provided with an aperture 75 adapted to receive the rivet 65 and with an aperture 76 adapted to receive the rivet 55.

The lamination 43 is also provided with a notch 77 defining a downwardly-directed edge 78 which rests on the upper edge 60 of the bight of the front frame 13. The lamination 43 is provided with an aperture 79 adapted to receive the pivot pin 69. As is best evident in FIG. 5, the rivet 65 is used to lock together all of the laminations except the outside laminations 38 and 39. The pivot pin 69 is provided with a large central portion which engages the apertures 68 and 79 in the laminations 41 and 43 and similar apertures in the laminations 44, 45, 46, 47, and 42; this central portion is also forged at the ends to lock these members together in the manner of a rivet. In addition, the pivot pin is provided with reduced portions 81 which engage corresponding notches 82 in the side frames 11 and 12. This arrangement is best shown in FIG. 6 wherein the notch 82 is shown as consisting of a curved edge 83 having the same radius of curvature as the reduced portion 81 of the pivot pin 69. Tangential horizontal edges extend outwardly from the curved edge 83 and intersect two straight edges 84 and 85. Edge 84 is exactly perpendicular to the edge of the side frame 11 while the edge 85 is generally vertical.

Referring to FIG. 2, it can be seen that the lower end of the hammer lifter 29 is provided with a hook 86 which engages a rectilinear recess 87 in the hammer 25, the recess being rather shallow so that the hammer does not contact any portion of the hammer lifter 29 except the hook 86.

The lamination 43 is provided with a downwardly-directed cam notch 88 defined by two vertical edges 89 and 91 and an inclined edge 92. The lamination 43 is also provided with two downwardly-directed abutments 93 and 94 which are spaced and parallel and are joined by a horizontal edge 95.

The operation of the stapler will now be readily understood, in view of the above description. When the stapler is not in use, the handle 19 is in a generally horizontal position adjacent the plastic handle 18 and is held in that position by the lock loop 23 engaging the slots 24 in the downwardly-directed flanges of the handle 19. During operation, however, the handle occupies the upper position (free of the lock loop 23) shown in FIGS. 1 and 2. FIG. 2 shows the stapler without staples in place and with the machine at rest. When staples are inserted in the staple guide 17 by removal of the base 15, the staple-pressure slide 32 is urged to the left by the spring 52. The user grasps the stapler by placing his hand around the handle 19 and the plastic handle 18 and squeezes them together. This causes the lifter 29 to move upwardly against the pressure of the spring 36. The hook 86 on the end of the lifter 29 is urged into the recess 87 as far as it will go by the spring 49. As soon as the hammer is lifted a substantial distance (carrying the staple blade 26 with it) a staple is pressed into position underlying the staple blade by the slide 32. As the lifter 29 moves upwardly, carrying the hammer 25 and the staple blade 26 with it, the upper end of the lifter eventually strikes the cap 37, particularly the laminations 43, 44, 45, 46, and 47 thereof. The main body of the laminations 41 and 42 cover the notch 88 of the central laminations, thus providing a box-like opening of approximately the width of the lifter. The lifter 29 moves within the opening and slides along the vertical edge 88, eventually striking the inclined edge 92. Its upper end is forced to the left (in FIG. 2), thus forcing its lower end (having the hook 86) to the right. Eventually, the camming action removes the hook 86 entirely from the recess 87 of the hammer 25 and the hammer moves downwardly under the impetus of the pressure of the spring 36. The staple blade 26 strikes the foremost staple and forces it

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downwardly into the material against which the base 16 is pressed. The hammer in its downward movement strikes the rubber bumper 54, thus absorbing some of the shock. The main bodies of the spring-confining laminations 41 and 42 form sides for the recess defined by the abutments 93 and 94 on the laminations 43 et al. and the edges 95 thereof. These provide a downwardly-directed box-like structure which encloses the upper end of the spring 36 and prevents it from moving within the stapler. In addition, the curved portions 73 and 74 of the laminations 41 and 42 embrace the upper end of the spring, the manner in which this is done being shown in FIG. 2. It should be noted that the spring 49 forces the hook 86 into the recess 87 of the hammer 25, but the distance the hook may proceed is limited by the bottom of the recess. This means that only a pre-determined amount of movement is necessary at the top of the lifter 29 to remove the hook from the hammer and release it for downward movement.

Now, when it is desired to replace the spring 36, it is only necessary to remove the cap member 37. This is done by removing the lock spring 56 and the rivet 55. Then, the outside laminations 38 and 39 may immediately be lifted out, after which the central body formed by the spring-confining laminations 41 and 42 and the lifter cam laminations 43, 44, 45, 46, and 47 may be lifted out as a unitary body by pivoting them about the pivot pin 69 and sliding this pin out of the notch 82. One of the interesting aspects of this construction is that the elongated, downwardly-depending portions of the outside laminations 38 and 39 exactly fill the space within the channel-shaped front frame 13 that is not occupied by the side members 11 and 12, since these laminations have the same thickness as the side members. This is shown clearly in FIG. 5. In other words, the side laminations and the side members form a single flat surface in which the remainder of the laminations may slide. These downwardly-depending parts of the outside laminations 38 and 39 also serve as added support for the leg 71 and the corresponding leg on the spring-confining laminations 41 and 42, so that the upper end of the spring 36 is confined in a rigid recess; this is important in view of the large lateral forces produced by the spring during a stapling cycle.

It is obvious that minor changes may be made in the form and construction of the invention without departing from the material spirit thereof. It is not, however, desired to confine the invention to the exact form herein shown and described, but it is desired to include all such as properly come within the scope claimed.

The invention having been thus described, what is claimed as new and desired to secure by Letters Patent, is:

1. A stapler, comprising
 - (a) a frame comprising a section of U-shaped cross-section having a bight and two side flanges defining an elongated chamber,
 - (b) a hammer slidable in the chamber,
 - (c) a spring residing in the chamber and engaging the hammer at one end, and
 - (d) a cap member mounted in the chamber, the cap member being formed with a spring recess in which the other end of the spring resides, and
 - (e) a readily releasable fastener means holding the cap member in the chamber and permitting ready removal of the cap member, the fastener means comprising a removable rivet extending through the side flanges of the frame and through the cap member, the fastener means also including a pivot pin extending through the cap member and residing in slots in the frame, the cap member having a ledge which rests on the end edge of the bight of the frame.

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2. A stapler, comprising
- (a) a frame comprising a section of U-shaped cross-section having a bight and two side flanges defining an elongated chamber,
 - (b) a hammer slidable in the chamber,
 - (c) a spring residing in the chamber and engaging the hammer at one end, and
 - (d) a cap member mounted in the chamber, the cap member being formed with a spring recess in which the other end of the spring resides, and
 - (e) a readily-releasable fastener means holding the cap member in the chamber and permitting ready removal of the cap member, the fastener means comprising a removable rivet extending through the side flanges of the frame and through the cap member, the fastener means also including a pivot pin extending through the cap member and residing in slots in the frame.
3. A stapler as set forth in claim 2, wherein the cap member is formed with a group of first laminations, each having a notch forming part of a cam recess and a notch forming part of the spring recess, a second lamination

on either side of the group of first laminations, each second lamination having a leg with a curved portion, the curved portions forming a socket in which the spring resides, and a third lamination against each second lamination and engaging opposed surfaces of the chamber, all of the laminations having coextensive edges adapted to rest on the edge of the bight of the said front frame.

4. A stapler as recited in claim 3, wherein each third lamination is provided with an elongated leg which resides between the leg of the adjacent second lamination and the said surface of the chamber to support the leg of the second lamination against lateral pressure from the spring.

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