

Nov. 25, 1952

H. A. GRANFIELD

2,618,778

FULL THROW MECHANISM FOR NAILING MACHINES

Filed March 15, 1951

2 SHEETS—SHEET 1

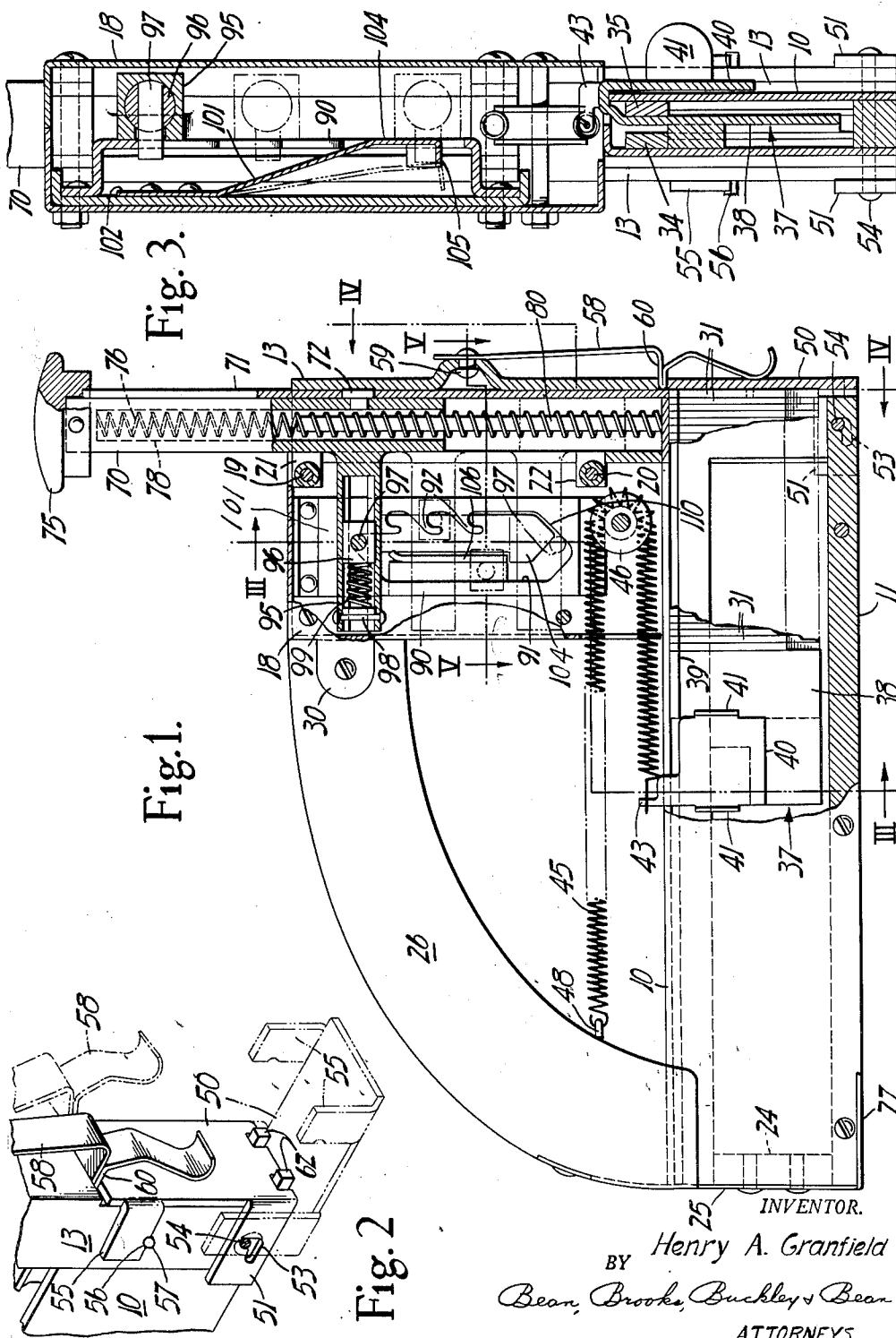


Fig. 2

Fig. 1.

Fig. 3.

INVENTOR.
 BY Henry A. Granfield
 Bear, Brooks, Buckley & Bear.
 ATTORNEYS

Nov. 25, 1952

H. A. GRANFIELD

2,618,778

FULL THROW MECHANISM FOR NAILING MACHINES

Filed March 15, 1951

2 SHEETS—SHEET 2

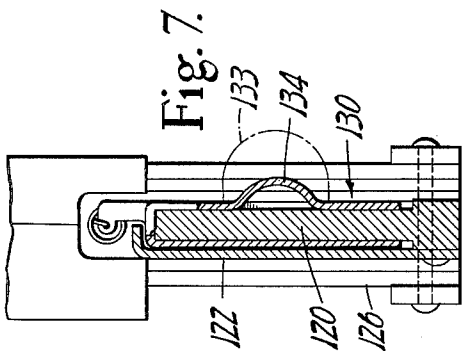
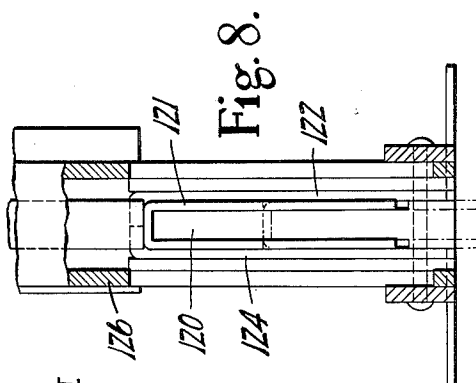
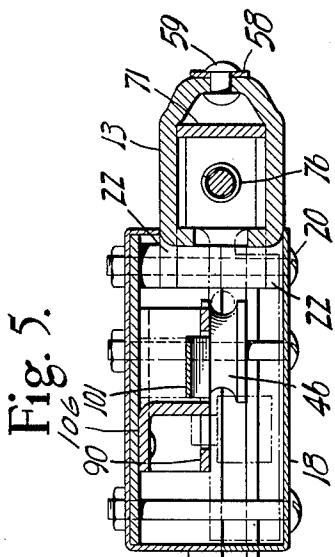


Fig. 6.

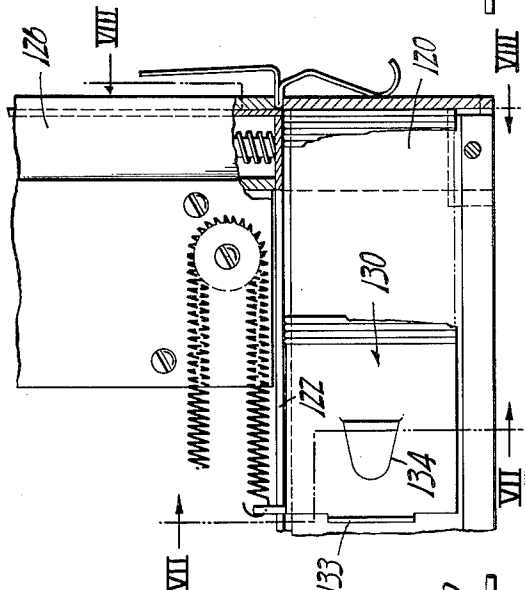
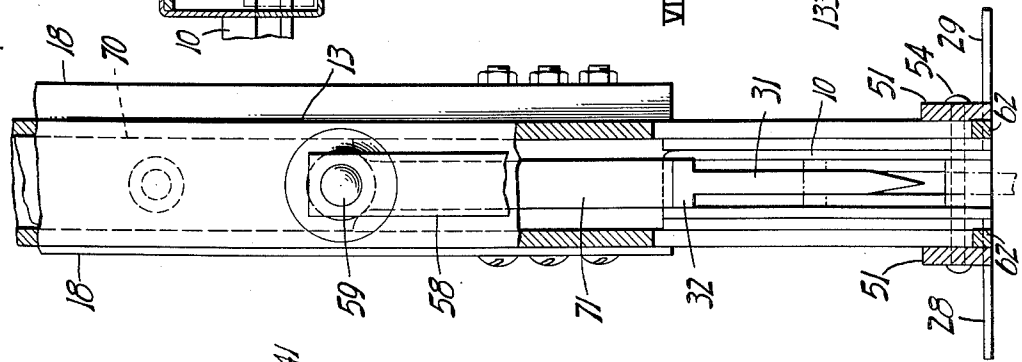
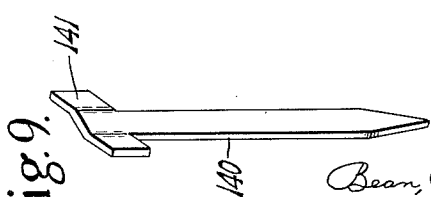


Fig. 9.



INVENTOR.
Henry A. Granfield
BY
Bean, Brooks, Buckley & Bean
ATTORNEYS

UNITED STATES PATENT OFFICE

2,618,778

FULL THROW MECHANISM FOR NAILING
MACHINES

Henry A. Granfield, Buffalo, N. Y., assignor to
The Dura-Rapid Nailer Co., Inc., Buffalo, N. Y.,
a corporation of New York

Application March 15, 1951, Serial No. 215,767

7 Claims. (Cl. 1—46)

1

This invention relates to nail or staple feeding and driving devices and particularly to certain novel features of construction and operation of devices of this general class.

In the prior art various proposals have been advanced with the general object of providing a staple driving mechanism wherein the driving parts cannot return to begin a new stroke until an ensuing stroke has been completed. These prior proposals have been generally impractical but even more so when applied to heavy duty staple or nail driving mechanisms, as distinguished from ordinary paper stapling devices such as are widely used in offices and the like.

The present invention provides a staple or nail feeding and driving arrangement which is particularly useful and practical in constructing devices of this general class which may be used to drive staples and nails of sizes and lengths which could not be driven with the usual hand-operated plunger up to now for the reason that more than one thrust or blow against the plunger would be required to fully drive a fastener.

Other objects and advantages which are attendant upon the use of the principles of construction embodied in the present invention will occur to those skilled in the art from a consideration of the embodiments which are set forth herein by way of example and which are illustrated and described in detail in the accompanying drawings and the following specification. It is to be understood, however, that these embodiments are by way of example only and that the principles of the invention are not limited thereto or otherwise than as defined in the appended claims.

In the drawings:

Fig. 1 is a side elevational view of one form of the apparatus of the present invention with portions thereof broken away for clearer illustration;

Fig. 2 is a fragmentary perspective view of the lower front portion of the device of Fig. 1;

Fig. 3 is a fragmentary cross-sectional view on the line III—III of Fig. 1 but on an enlarged scale;

Fig. 4 is a front elevational view with portions thereof shown in cross-section as indicated by the line IV—IV of Fig. 1;

Fig. 5 is a fragmentary cross-sectional view taken approximately on the line V—V of Fig. 1;

Fig. 6 is a fragmentary side elevational view with portions thereof in cross-section showing a modified form of the apparatus of the present invention;

2

Fig. 7 is a fragmentary cross-sectional view on the line VII—VII of Fig. 6;

Fig. 8 is a fragmentary cross-sectional view taken on the line VIII—VIII of Fig. 6; and

Fig. 9 is a perspective view of an alternate form of nail formation.

Like characters of reference denote like parts throughout the several figures of the drawings. The general framework of the form of the present invention illustrated in detail in Figs. 1 through 5 comprises a longitudinally extending inverted channel element 10 having a lower rail element 11 fixed between the lower ends of its flanges to form a rigid longitudinally extending rectangular tube. At the front end of the device a generally rectangular vertical tubular element 13 extends upwardly from channel 10 and has the lower portions of its front and rear walls cut away so that the lower side wall portions of tubular element 13 embrace the side wall portions of channel 10 at its forward end.

A generally rectangular casing member 12 is disposed just above channel member 10 and immediately rearwardly of tubular element 13 and is fixed to the latter by means of bolt and nut connections designated 19 and 20 in Fig. 1, these connections passing through rearwardly extending ears 21 and 22 carried by tubular member 13 as shown in Figs. 1 and 5. Of course, casing member 12 may be secured to the device generally in any other desired manner as by riveting or welding.

Referring to Fig. 1, the inverted channel element 10 has its rear portion closed off by a block 24 which may be secured in any desired manner, and a rear plate member 25 is fixed to block 24 and has an upwardly extending portion which supports the rear end of a handle element 26. The lower portion of plate member 25 extends beneath channel 10 as at 27 in Fig. 1 and includes laterally projecting portions shown at 28 and 29 in Fig. 4 which provide feet to support the device securely on a work surface in the normal position of use.

In the present instance the front of handle element 26 is fixed to casing 12 by means of ears 30 projecting rearwardly from casing 12 as shown in Fig. 1, but, of course, may be of wood, plastic, die-cast metal, sheet metal, or of some other form, and its mode of connection with the assembly proper would vary in accordance with its nature and form.

The form of device illustrated in Figs. 1 through 5 is adapted to accommodate and drive fasteners 55 which are generally of nail-like form. These

3

fasteners are of stamped sheet metal in the illustrated instance and are designated 31 in the drawings, although they may be formed of wire or other material. One of the fasteners 31 is shown in Fig. 4 as comprising a shank portion tapered to a sharp wedge point at its lower point and having an enlarged flat head portion 32. Referring particularly to Fig. 3, the upper interior portion of channel 10 has fixed rigidly therein a pair of rails 34 and 35 upon which the head portions 32 of a row of fasteners 31 are adapted to ride with the shank portions of the fasteners depending between rails 34 and 35.

A follower or pusher element for a row of fasteners 31 is designated generally 37 and is shown in Figs. 1 and 3 as comprising a main web portion 38 which follows the shank portions of the fasteners 31 and upper lateral flanges 39 which ride on rails 34 and 35. Pusher 37 further includes an outwardly and downwardly extending flange 40 at its upper portion. This flange extends through a longitudinal slot in the upper surface of channel element 10 and extends downwardly along the side thereof and includes a pair of outwardly extending ears 41 for manipulating the pusher 37.

At its upper rear portion pusher 37 further includes an ear 43 to which is anchored one end of an extension coil spring 45 which passes over a pulley 46 mounted for free rotation in casing 13 and is secured at its opposite end of handle element 26 as at 48. Spring 45 accordingly urges the pusher 37 resiliently to the right, as viewed in Fig. 1.

Fasteners 31 are introduced to channel 10 at its right-hand end as viewed in Fig. 1. As illustrated in Figs. 1 and 2, a front closure plate 50 has side flanges 51 at its lower portions, which flanges extend rearwardly along the outer faces of the lower side wall portions of tubular member 13 as best shown in Fig. 2. Flanges 51 are provided with angular slots 53, and a pivot pin 54 passes through the slots 53, through the lower side wall portions of tubular member 13, through the lower portions of the side flanges of channel 10, and through bottom rail 11. Closure plate 50 is further provided with flanges 55 which are notched at their lower edges as at 56 and a pair of pins 57 project from the opposite sides of tubular member 13.

In the closed position illustrated in full lines in Figs. 1 and 2 a resilient closure clip 58 which is pivoted to tubular member 13 at 59 has a return bent flange portion 60 which fits between the upper end of closure plate 50 and the lower edge of the front wall of tubular member 13. In this position of the parts closure plate 50 cannot be pivoted forwardly to an open position by reason of the interlocking engagement of notches 56 and pins 57 and also by reason of a pair of forward projections 62 at the lower end of tubular member 13 which engage in notches in the lower edge of plate 50.

When plate 50 is to be opened to permit reloading of the device, closure clip 58 must be resiliently moved forwardly as indicated in dot-and-dash lines in Fig. 2, whereupon plate 50, by reason of notches 53, may be moved upwardly thence forwardly which disengages notches 56 and pins 57, thence forwardly until the lower front portion of plate 50 moves forwardly of projections 62, and plate 50 may then be swung forwardly and downwardly to the dot-and-dash line position indicated in Fig. 2.

The fastener driving means comprises a plunger

4

70 which is vertically slidable in tubular element 13 and is provided at its front face with a driving blade 71 which is likewise slidable vertically in tubular member 13 and which is retained for vertical movement with plunger 70 by means of a pin 72.

Plunger 70 has fixed to its upper end a handle element 75 and is resiliently urged to an upward position by a coil spring 76 which rests at its lower end against the upper surface of channel 10 and extends upwardly into an axial bore 73 in post 70. A spring pin 80 is fixed to the upper surface of channel 10 and maintains alignment of spring 76. It will be noted that the lower end of driving blade 71 is in engagement with the head of a fastener 31 in the position illustrated in Fig. 1, so that downward movement of plunger 70 by impact upon handle 75 will drive the fastener.

Casing 18 contains mechanism for insuring, in a safe, positive, and practical manner, that plunger 70 and driving blade 71 will execute a full driving stroke before these parts can return upwardly to admit a subsequent fastener under the urge of spring 45. This mechanism will now be described.

The arrangement and construction of the means for preventing partial return strokes of the driving mechanism is an important part of the present invention, and one form of such non-return or full stroke mechanism will now be described, reference being had particularly to Figs. 1 and 3. A control plate 90 is fixed in casing 18 or may comprise a part of casing 18 and its main body portion extends generally vertically therein in a fore and aft plane. Plate 90 has a central opening 91 whose right-hand side, as viewed in Fig. 1, is provided with a vertical series of downwardly directed ears 92 which form, in effect, a series of ratchet teeth or stops.

Plunger 70 has fixed thereto a rearwardly extending hollow sleeve element 95 which projects into casing 18 across the outer face of control plate 90. Sleeve 95 contains an axially slidable bar or stud 96 and a pin 97 which projects rigidly from bar 96 extends into the opening 91 in control plate 90.

A spring seat 98 is fixed in the outer or rearward end of sleeve 95 and a compression coil spring 99 acts between spring seat 98 and bar 96 to urge the latter and pin 97 to the right, as viewed in Fig. 1.

A leaf spring camming device is designated 101 and, in the form illustrated, has its upper end fixed to casing 18 as at 102. The camming device 101 flares downwardly from the wall of casing 18 toward the plane of control plate 90, as shows clearly in Fig. 3, and the lower portion thereof normally lies substantially in such plane as at 104 in Fig. 3. The lower end of camming device 101 may be flanged as at 105 to provide a V-shaped camming nose at its lower end. A vertical flange 106 is fixed to the wall of casing 18 in any desired manner and, as shown in Fig. 1, forms a rigidly disposed continuation of the left-hand edge of the lower camming portion of the camming device 101.

The operation of the foregoing non-return or full stroke mechanism is as follows. If the handle 75 is struck in such manner and with such force that it executes less than a full downward stroke, the urge of spring 99 will cause pin 97 to move to the right, as viewed in Fig. 1, and enter beneath one of the ratchet teeth 92 which ever tooth lies immediately above the point

5

where pin 97 commences its upward movement with plunger 70. This will arrest upward movement of the plunger 70 in any one of a number of positions, depending on the number of ratchet teeth which may be provided and the degree of downward movement that has been imparted to plunger 70.

This prevention of upward movement leaves the lower portion of the driving blade 71 in a position where it occupies the space from which a fastener 31 has been partly driven and, in cooperation with the partly driven fastener, forms an effective block against feeding of the next successive fastener. This block is effective against both the upper and lower portions of the next successive fastener so that no cocking or partial feeding can take place until a previous fastener has been fully driven. Even if a fastener is driven below the top of bottom rail 11, the plunger 70 will be arrested in the lowermost position as defined by the ratchet teeth 92 and driving blade 71 will occupy so much of the position vacated by the previous fastener as to wholly prevent even partial feeding of a successive fastener.

When pin 97 moves downwardly against the slanting surface of camming device 101, it forces the lower portion 104 of the latter to the left, as viewed in Fig. 3, and when pin 97 reaches the slanting edge 110 at the lower end of the opening 91 in control plate 90, it is cammed to the left thereby against the resistance of spring 99, the outer end of pin 97 riding against the lower surface portion 104 of camming device 101. When pin 97 reaches the dot-and-dash line position indicated just below the camming nose 105 at the lower end of camming device 101, Fig. 1, the lower portion 104 of camming device 101 can again spring back to the position illustrated in full lines in Fig. 3.

This is a fully driven position of the device, and plunger 70 is now free to move upwardly without interference from ratchet teeth 92. This is accomplished by reason of the fact that, in subsequent upward movement from its lower dot-and-dash line position, pin 97 rides along the left-hand portion of the lower camming nose 105 and, under the urge of spring 99, upwardly along the left-hand vertical edge of the portion 104 of camming device 101 and along the left-hand side of flange 106 which, in effect, forms an upward continuation of such vertical edge portion.

Flange 106 retains the pin 97 in its withdrawn or left-hand position, as viewed in Fig. 1, until pin 97 has moved upwardly beyond the uppermost ratchet tooth 92, whereupon flange 106 terminates and pin 97 is freed to move to its full line position of Fig. 1, ready to execute another full stroke cycle of operation.

Reference will now be had to the embodiment illustrated fragmentarily in Figs. 6, 7, and 8, wherein the fastener to be fed and driven is in the form of a staple, rather than a nail. The general construction of the device in Figs. 6, 7, and 8 is the same as that in the previous embodiment of Figs. 1 through 5, and only so much of the present embodiment will be described as will be necessary to understand the differences relating to supporting and feeding staples, as distinguished from the nail-like fasteners of the previous embodiment.

In place of the assembly comprising channel 10 and bottom rail 11, the embodiment of Figs. 6, 7, and 8 provides a central rail 120 which is

6

straddled by a row of staples 121 and a plate member 122, which closes one side and a portion of the top of the staple magazine area, plate 122 being fixed to a lateral lower extension of rail 120. At its forward end rail 121 may be provided with a similar side closure plate 124 at the other side thereof to provide an inverted channel formation over such forward end so that a vertical tubular member 126 corresponding to the tubular member 13 of the previous embodiment may have its lower side wall portions in straddling relation with walls 122 and 124.

The only other difference between the embodiment now being described and that of Figs. 1 through 5 is the form of the pusher element for the staples which is designated generally 130 in Fig. 6. Pusher 130 is in the form of an inverted channel and straddles rail 120 in the same manner as the staples. Because of the single side plate 122, one side of pusher 130 is exposed as shown in Figs. 6 and 7, and this side is provided with a manipulating flange 133 and a protuberance 134 which engages against the rear edge of plate 124 to serve as a forward stop for the pusher 130.

Fig. 9 shows an alternate form of nail type fastener having a shank portion 140 and a head portion 141, the head portion being of zig-zag form to avoid splitting the wood when the head extends along the grain of the wood and also to prevent the nail from being readily pulled through split wood.

What is claimed is:

1. In a fastener feeding and driving device having a longitudinal magazine portion and a fastener driving plunger mounted adjacent one end thereof for reciprocation transversely of the magazine portion to drive a fastener therefrom; non-return means operable to insure the ultimate completion of fastener driving strokes of the plunger which have advanced to a predetermined degree, said means comprising a relatively fixed member having a series of ratchet teeth extending parallel to the plunger path, a pawl carried by said plunger and engageable successively with the ratchet teeth during driving movement of the plunger to arrest the plunger against return movement in various driving positions, a relatively fixed trackway adapted to guide said pawl for return movement in a path withdrawn from said ratchet teeth, and cam means engaging said pawl below said ratchet teeth and adapted to deflect said pawl into said trackway for full stroke return movement withdrawn from the ratchet teeth.

2. In a fastener feeding and driving device having a longitudinal magazine portion and a fastener driving plunger mounted adjacent one end thereof for reciprocation transversely of the magazine portion to drive a fastener therefrom; non-return means operable to insure the ultimate completion of fastener driving strokes of the plunger which have advanced to a predetermined degree, said means comprising a member having a series of interlocking formations extending parallel to the plunger path and a member carried by said plunger, one of said members being mounted for bodily movement in a direction at right angles to the path of the plunger and spring means acting against the bodily movable member to urge it toward the other member whereby said second member is engageable successively with the interlocking formations during driving movement of the

plunger to arrest the plunger against return movement in various driving positions, a relatively fixed trackway adapted to guide said bodily movable member for return movement in a path withdrawn from said other member, and cam means below said interlocking formations and adapted to deflect said bodily movable member into said trackway for full stroke return movement withdrawn from the other member.

3. In a fastener feeding and driving device having a longitudinal magazine portion and a fastener driving plunger mounted adjacent one end thereof for reciprocation transversely of the magazine portion to drive a fastener therefrom; non-return means operable to insure the ultimate completion of fastener driving strokes of the plunger which have advanced to a predetermined degree, said means comprising a relatively fixed member having a series of interlocking formations extending parallel to the plunger path, a latch pin carried by said plunger and spring means acting against the latch pin to render it engageable successively with the interlocking formations during driving movement of the plunger to arrest the plunger against return movement in various driving positions, a relatively fixed trackway adapted to guide said latch pin for return movement in a path withdrawn from said interlocking formations, and cam means engaging said latch pin below said interlocking formations and adapted to deflect said latch pin into said trackway for full stroke return movement withdrawn from the interlocking formations.

4. In a fastener feeding and driving device having a longitudinal magazine portion and a fastener driving plunger mounted adjacent one end thereof for reciprocation transversely of the magazine portion to drive a fastener therefrom; non-return means operable to insure the ultimate completion of fastener driving strokes of the plunger which have advanced to a predetermined degree, said means comprising a relatively fixed member having a series of interlocking formations extending parallel to the plunger path, a detent carried by said plunger and engageable successively with the interlocking formations during driving movement of the plunger to arrest the plunger against return movement in various driving positions, means guiding said detent for return movement in a path withdrawn from said interlocking formations, and cam means adapted to deflect said detent into engagement with said guide means for return movement withdrawn from the interlocking formations.

5. In a fastener feeding and driving device having a longitudinal magazine portion and a fastener driving plunger mounted adjacent one end thereof for reciprocation transversely of the magazine portion to drive a fastener therefrom; non-return means operable to insure the ultimate completion of fastener driving strokes of the plunger which have advanced to a predetermined degree, said means comprising a relatively fixed member having a series of interlocking formations extending parallel to the plunger path, a latch pin member carried by said plunger, one of said members being mounted for bodily movement in a direction toward and away from the

other and spring means acting against the bodily movable member to urge it toward the other member to successively engage the latch pin with the interlocking formations during driving movement of the plunger to arrest the plunger against return movement in various driving positions, a relatively fixed trackway adapted to guide said bodily movable member for return movement in a path withdrawn from said other member, and cam means engaging said bodily movable member below said interlocking formations and adapted to deflect the same to said trackway for return movement withdrawn from the other member.

6. In a fastener feeding and driving device having a longitudinal magazine portion and a fastener driving plunger mounted adjacent one end thereof for reciprocation transversely of the magazine portion to drive a fastener therefrom; non-return means operable to insure the ultimate completion of fastener driving strokes of the plunger which have advanced to a predetermined degree, said means comprising a relatively fixed member having a series of interlocking formations extending parallel to the plunger path, a detent carried by said plunger and spring means urging the same into successive engagement with the interlocking formations during driving movement of the plunger to arrest the plunger against return movement in various driving positions, a relatively fixed trackway adapted to guide said detent for return movement in a path withdrawn from said interlocking formations, and cam means engaging said detent below said interlocking formations and adapted to deflect said detent to said trackway for return movement withdrawn from the interlocking formations.

7. In a fastener feeding and driving device having a longitudinal magazine portion and a fastener driving plunger mounted adjacent one end thereof for reciprocation transversely of the magazine portion to drive a fastener therefrom; non-return means operable to insure the ultimate completion of fastener driving strokes of the plunger which have advanced to a predetermined degree, said means comprising a relatively fixed member having a series of interlocking formations, a detent movable with said plunger and spring means urging the same into successive engagement with the interlocking formations during driving movement of the plunger to arrest the plunger against return movement in various driving positions, and means guiding said detent for return movement in a path withdrawn from said interlocking formations, and cam means engaging said detent below said interlocking formations and adapted to deflect said detent to said guiding means for return movement withdrawn from the interlocking formations.

HENRY A. GRANFIELD.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,140,588	Krantz	Dec. 20, 1938
2,218,794	Kilbride	Oct. 22, 1940
2,380,785	Percoco	July 31, 1945