Aug. 18, 1953 M. B. SMITH ET AL 2,648,841

NAIL GUN

Filed July 29, 1952 2 Sheets-Sheet 1

FIG. 1.

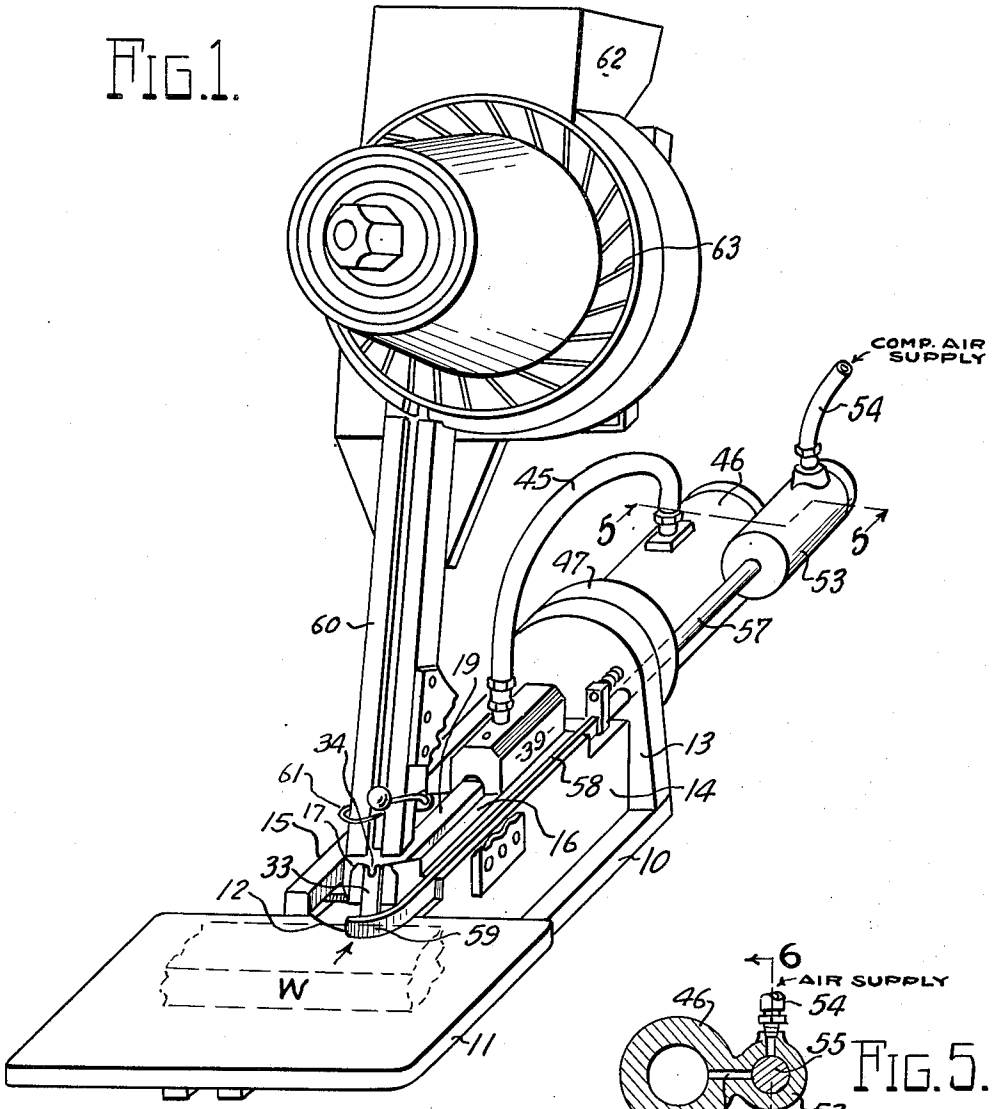


FIG. 5.

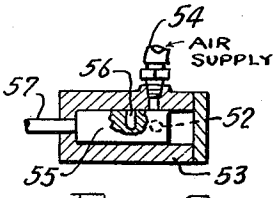


FIG. 6.

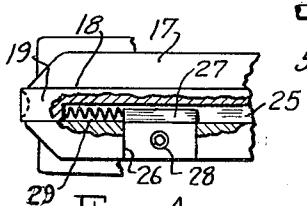


FIG. 4.

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Filed July 29, 1952 2 Sheets-Sheet 2

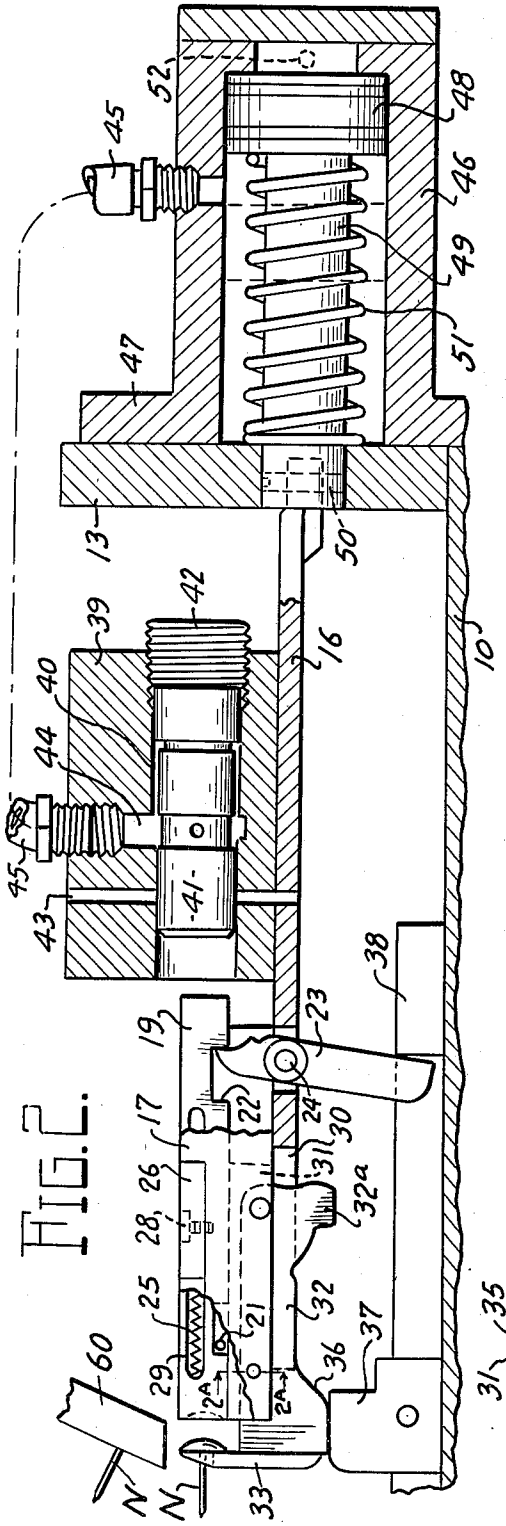


FIG. 2

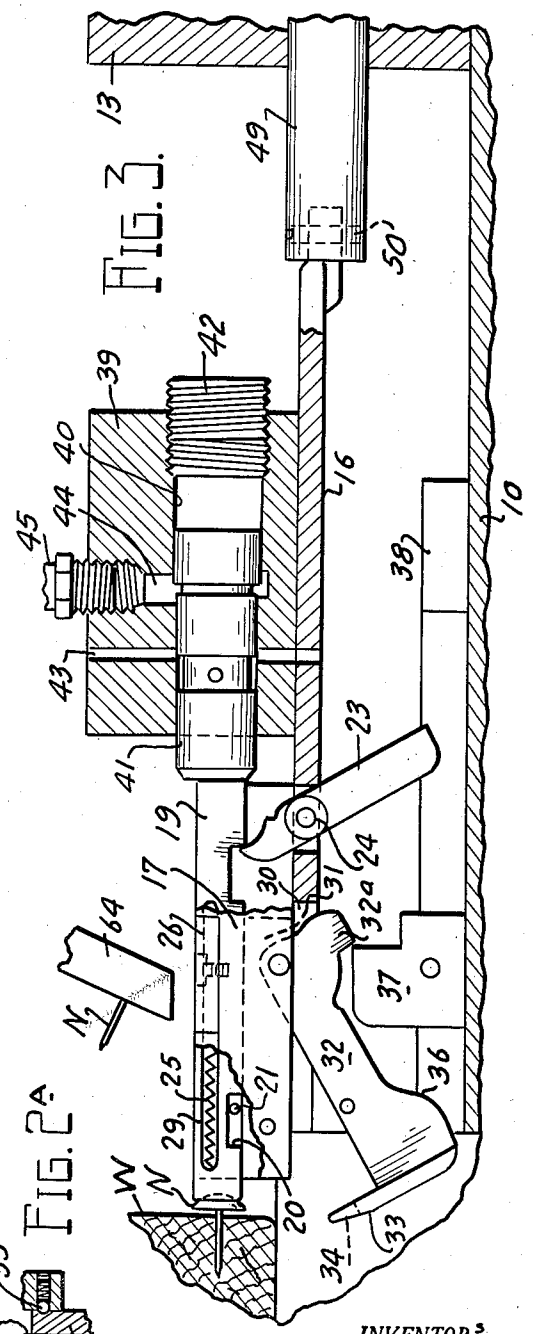


FIG. 3

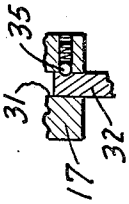


FIG. 2A

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NAIL GUN

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Application July 29, 1952, Serial No. 301,572

11 Claims. (Cl. 1—46.4)

1

This invention relates to nailing machines, but more particularly to nailing machines for driving upholstery nails into work pieces.

An object of the invention is to produce a simple and efficient nailing machine for driving upholstery nails into work pieces automatically and rapidly with a minimum amount of effort.

Another object is to produce a new and improved nailing machine which is fluid-operated and drives the nail into a work piece without the necessity of the operator positioning or otherwise handling the nail.

A further object is to produce a portable pneumatic nailing machine which is rendered operative by the work piece in the desired position for receiving the nail, the machine continuing its operation until the work piece is moved away, whereupon the machine automatically stops.

Other objects and advantages of the invention will hereinafter appear, and for purposes of illustration but not of limitation, an embodiment of the invention is shown on the accompanying drawings, in which

Figure 1 is a front perspective view of the nailing machine;

Figure 2 is an enlarged longitudinal sectional view somewhat diagrammatic showing the important working parts of the machine, the same being shown in position when the nail has been delivered to the machine but prior to the time when the nailing operation is performed;

Figure 2A is a fragmentary sectional view on the line 2A—2A of Figure 2;

Figure 3 is a view similar to Figure 2, showing the parts in operative position when the air hammer is operated to drive the nail into the work piece;

Figure 4 is a top plan fragmentary view of the guide block driving pin and associated parts;

Figure 5 is a transverse sectional view on the line 5—5 of Figure 1; and

Figure 6 is a sectional view on the line 6—6 of Figure 5.

The illustrated embodiment of the invention comprises a nailing machine having a flat base 10 which suitably supports at its front end a work supporting platform or table 11. At the rear end of the base 10 is an upright wall or plate 13, and rising from the base 10 in front of the wall 13 are laterally spaced upright walls 14 and 15 which are suitably secured to the base. Slidable in longitudinal grooves (not shown) in the inner sides of the upright walls 14 and 15, and above the base 10, is a carriage in the form of a flat plate 16 on the forward end of which is mounted

2

a guide block 17 suitably fixed to the upper side of the carriage plate 16. In the upper side of the guide block 17 is a longitudinally extending open ended groove or guide channel 18 (Figure 4) in which is slidably mounted a driving pin 19. The driving pin 19 is rectangular in cross section and has on its under face a notch 22 adjacent the rear end thereof, into which extends the pointed end portion of a catch lever 23 which passes through a hole in the carriage plate 16 and is pivotally mounted intermediate its ends on a pivot pin 24, the longer lower end of the lever 23 depending below the plate 16 as shown in Figures 2 and 3.

In one side of the driving pin 19 is a longitudinally elongate groove 25 and fitting into a notch in the guide block 17 at one side of the guide channel 18 is a plate 26 which has an integral lateral extension 27 of less thickness than the plate projecting into the elongate groove 25. The extension 27 provides an abutment for one end of a coil spring 29 arranged within the groove which bears at its opposite end against the adjacent end of the groove 25. The plate 26 is held in place by a screw 28 which extends into the adjacent portion of the guide block 17.

In the forward end of the carriage plate 16 approximately centrally thereof is a slot 30 registering with this slot is a groove 31 in the under side of the guide block 17. Disposed within the slot 30 and groove 31 is a pivoted holding finger 32 which, as shown, is pivoted at its rear end portion and has a front vertical extension 33, the free end of which has a notch 34. When the holding finger 32 is in its horizontal position as shown in Figure 2, the notch 34 is so disposed that it receives a nail N with the shank thereof disposed horizontally and its head at the rear.

The pivoted holding finger 32 is retained in horizontal or useful position by a spring-tensioned ball 35 (Figure 2A). Positively holding the finger 32 in its raised position, as shown in Figure 2, is a stationary cam block 37 mounted on the base 10 and engageable with a cam surface 36 on the finger 32. Thus it will be seen that when the carriage plate 16 moves rearwardly or to the right from the position shown in Fig. 3 to the position of Figure 2, the cam 36 engages the front curved edge portion of the block 37, rocks it in a clockwise direction, and positively holds the extension 33 in the desired upright nail-receiving position.

At the rear end of the holding finger 32 in the region of its pivotal mounting is a rear extension 32a which abuts against the rear face of the cam

block 37 when the carriage plate 16 moves forwardly, thereby positively to rock the holding finger 32 in a counterclockwise direction to the position shown in Figure 3, thereby to move it away from the nail when the nail is being driven into the work piece.

Spaced rearwardly from the cam block 37 is an abutment element 38 which is engaged by the lower end of the catch lever 23 when the carriage plate 16 moves rearwardly to its inoperative position, thereby shifting the driving pin or anvil 19 rearwardly in order to afford space for the reception of the nail N between the nose or front end of the driving pin and the front vertical extension 33 of the holding finger.

Fixed to the upper surface of the carriage plate 16 rearwardly of the guide block 17 is an air hammer block or chest 39 which is provided with a horizontal bore 40 aligned with the rear end of the driving pin 19. Reciprocable within the bore 40 is an air hammer 41, the rear end of the bore 40 being closed by a screw plug 42. Leading from the forward end portion of the bore 40 is an air exhaust passage 43 and spaced rearwardly therefrom is a compressed air inlet passage 44 opening into the bore 40 and to which a flexible tube 45 is connected. Detail description of the construction and operation of the air hammer 41 is not considered necessary. Suffice it to say that when air under pressure is delivered to an intermediate portion of the air hammer, the differential pressure areas are such, coupled with the exhaust passage, that the air hammer rapidly drives forwardly in response to compressed air from the position shown in Fig. 2 to the Fig. 3 position, wherein no forward drive by compressed air is exerted. Hammer 41 bounces back to the Fig. 2 position and will so reciprocate so long as compressed air is introduced. This structure is well-known to those skilled in this art so that further description thereof is not regarded as necessary.

The tube 45 leads to an intermediate portion of a cylinder 46 which has a flanged forward end suitably fixed to the rear face of the upright wall 13. Reciprocable within the cylinder 46 is a feed piston 48 which has a piston rod 49 extending through a hole in the wall 13, the front end of the piston rod having a pinned-on connection 50 with the rear end of the carriage plate 16. Disposed between the front face of the piston 48 and the wall 13 is a coil spring 51 which serves to actuate and hold the piston 48 and associated parts in retracted position when the compressed air is shut off. At the rear end of the cylinder 46 is a passage 52 which leads through the wall of a smaller control cylinder 53, which in this instance is welded to the outer wall of the cylinder 46. Leading to the rear end of the control cylinder 53 is a tube 54 which connects to a suitable source or supply of compressed air. An air pressure of seventy-five pounds per square inch has been found empirically to be satisfactory in this connection.

Reciprocable within the cylinder 53 is a piston 55 which has a groove 56 in its outer surface suitably positioned to provide a connecting bridge between the tube 54 and the lateral passage 52, thereby to enable air under pressure to pass to the cylinder 46 from the cylinder 53 when the piston 55 has been moved rearwardly within the cylinder 53 a sufficient extent.

Extending forwardly from the piston 55 is a piston rod 57 to the forward end of which is secured a spring-loaded thrust bar 58 which slides within a groove formed in the upper edge portion

of the wall 14 and terminates in an inwardly curved end portion 59 normally disposed in front of and in spaced relation to the front extension 33 of the holding finger 32 when in nail-holding position (Figure 2) curved end portion 59, being below the level of the path of movement of nail N and driving pin 19 does not interfere with the nailing operation.

The nails N are delivered to the notch 34 in the holding finger extension 33 from a chute 60 which is vertically inclined and has a release device 61 near its discharge end suitably rockable to release a nail pursuant to the reciprocatory movement of the carriage plate 16. A quantity of nails is first delivered to a hopper 62 which feeds them into an electrically rotated wheel 63 which causes them individually to slide down the chute 60 as will be readily understood. The nail feeding mechanism is a standard one available on the market and since it forms no part of the present invention, further description and illustration are not regarded as necessary, it being sufficient to point out that a single nail is delivered to the notch in the holding finger when the latter is in the position shown in Figure 2, preparatory to the nailing operation.

In operation, the operator places the work piece W as indicated in Figure 1, on the work table 11 and presses it against the curved end 59 of the thrust bar 58, exerting sufficient pressure thereagainst to shift the piston 55 rearwardly within the clinder 53 to enable air under pressure to pass from the tube 54 through the connecting passage 56, passage 52, to the cylinder 46 in rear of the piston 48. In this manner, the piston 48 is moved forwardly compressing the spring 51 and shifting the carriage plate 16 forwardly. It will be understood that a nail N has previously been delivered to the slot or notch 34 in the holding finger extension 33. As the carriage 16 moves forwardly, the catch arm 23 is enabled to rock in a counterclockwise direction so that the coil spring 29 can advance the driving pin 19 until its recessed forward end engages the rounded head of the nail N. Substantially at this time, the rear extension 32a on the holding finger 32 engages the rear face of the cam block 37 rocking the holding finger 32 in a counterclockwise direction, thus moving the nail engaging extension away from the nail N. The driving pin 19 then holds the nail in the desired position to be driven into the work piece W. About this time, the piston 48 will have uncovered the port leading to the flexible tube 45, enabling air under pressure to pass into the air hammer block or chest 39 and causing the air hammer 41 to reciprocate rapidly back and forth and imposing a hammering action against the rear end of the driving pin or anvil 19. Such recurrent blows operate to drive the nail N speedily into the work piece. It will be understood that all this time the thrust bar 58 will have been held in depressed relation, but as soon as the nailing operation has been accomplished, then the operator moves the work piece away from the curved end 59 of the thrust bar enabling the spring to return the thrust bar outwardly to its normal position and moving the control piston 55 substantially to the position shown on Figure 6, shutting off the passage of compressed air to the cylinder 46. Thereupon, the air hammer 41 immediately stops and the coil spring 51 returns the piston 48 to its rearmost position, retracting the carriage plate 16 and associated parts while the leakage of air forwardly past piston 48 will permit full return of the piston to its Fig. 2 posi-

tion, suitable conventional relief ports may be provided to accelerate the returning action of spring 51 on the piston if desired. When the carriage plate 16 moves rearwardly, the cam surface 36 on the holding finger 32 engages the cam block 37 and thereby causes the holding finger to be rocked upwardly to its original position, preparatory to receiving the next succeeding nail N. When the lower end of the catch lever 23 engages the abutment 38, the rocking movement of the lever 23 retracts the driving pin 19 in order to provide the desired spacing between the holding finger extension 33 and the front end of the driving pin 19 to enable the nail to be delivered to the notched end of the holding finger extension. In this position of the parts, the machine is ready for another nailing operation which is initiated by depression of the thrust bar 58 as above explained.

From the above description, it will be manifest that we have produced an exceedingly simple and satisfactory nailing machine which is particularly adapted for driving upholstery nails into parts of furniture such, for example, as upholstered seat and back panels of chairs. The nailing operation can be performed with great rapidity, it being merely necessary for the operator to place the work piece on the table 11 and exert pressure against the outer end of the thrust bar 58 which is instrumental in supplying air under pressure first to the feed piston 48 and then when the parts are in the proper position with respect to the nail to be driven, the air hammer is set in motion. All of this is accomplished speedily and with a minimum amount of effort.

It will be understood that numerous changes in details of construction, arrangement and operation may be effected without departing from the spirit of the invention especially as defined in the appended claims.

What we claim is:

1. A nailing machine comprising a nail holder for positioning a nail with respect to a work piece and mounted for movement to and from operative position, a driving pin for pressing the nail against the work piece after the holder has moved away from operative position, hammer means for recurrently striking the driving pin to drive the nail home, and means for successively actuating said nail holder, driving pin and hammer means.

2. A nailing machine comprising a nail holder for positioning a nail with respect to a work piece and mounted for movement to and from operative position, a driving pin for pressing the nail against the work piece after the holder has moved away from operative position, hammer means for recurrently striking the driving pin to drive the nail home, fluid actuated means common to said nail holder, driving pin and hammer means for sequentially shifting the holder away from useful position and concommitantly causing the driving pin to engage the nail, and operating the hammer means, and control means including a valve, ports and passages for rendering said fluid means effective.

3. A nailing machine comprising a nail holder for positioning a nail with respect to a work piece and mounted for movement to and from operative position, a driving pin for pressing the nail against the work piece after the holder has moved away from operative position, means to mount said driving pin for rectilinear shifting movements, a spring urging said driving pin toward the nail holder, means to retract said driving pin away from the nail holder to enable a nail to be fed to the latter and release the driving pin after a nail has been fed to the holder, hammer means for recurrently striking the driving pin to drive the nail home, means for successively actuating said nail holder, driving pin and hammer means, and control means for said actuating means.

4. A nailing machine comprising a nail holder for positioning a nail with respect to a work piece and mounted for movement to and from operative position, a driving pin for pressing the nail against the work piece after the holder has moved away from operative position, hammer means for recurrently striking the driving pin to drive the nail home, a common carriage for said driving pin, nail holder and hammer means shiftable toward and away from the work piece, and means for successively advancing the carriage, causing the nail holder to move away from operative position, and rendering the hammer means operative.

5. A nailing machine comprising a nail holder for positioning a nail with respect to a work piece and mounted for movement to and from operative position, a driving pin for pressing the nail against the work piece after the holder has moved away from operative position, fluid operated hammer means for recurrently striking the driving pin to drive the nail home, a shiftable carriage for said driving pin, nail holder and hammer means, a fluid operated piston for advancing said carriage, a cylinder for said piston, means responsive to carriage advance for shifting said nail holder away from operative position, and means rendered operative upon further advance of said piston for actuating said hammer means.

6. A nailing machine comprising a nail holder for positioning a nail with respect to a work piece and mounted for movement to and from operative position, a driving pin for pressing the nail against the work piece after the holder has moved away from operative position, fluid operated hammer means for recurrently striking the driving pin to drive the nail home, a shiftable carriage for said driving pin, nail holder and hammer means, a fluid operated piston for advancing said carriage, a cylinder for said piston, means responsive to carriage advance for shifting said nail holder away from operative position, means providing a conduit between said cylinder and hammer means for delivering fluid to the latter upon predetermined advance of the piston, and valve controlled means for delivering fluid under pressure to the outer end of said cylinder.

7. A nailing machine comprising a nail holder for positioning a nail with respect to a work piece and mounted for movement to and from operative position, a driving pin for pressing the nail against the work piece after the holder has moved away from operative position, fluid operated means for recurrently actuating the driving pin to drive the nail home, a shiftable carriage for said driving pin, nail holder and fluid means, a fluid operated piston for advancing said carriage, a cylinder for said piston, means responsive to carriage advance for shifting said nail holder away from operative position, means providing a conduit between said cylinder and fluid means for delivering fluid to the latter upon predetermined advance of the piston, valve controlled means for delivering fluid under pressure to the outer end of said cylinder, and spring means for retracting said piston.

8. A nailing machine comprising a shiftable carriage movable toward and away from the work, a nail holder in the form of a pivoted lever having a notched nail receiving end and mounted on said carriage, a spring biased driving pin slidable on said carriage to engage the head of the nail, said carriage being normally in retracted position, means for actuating said driving pin away from the nail holder when the carriage is retracted to afford space for feeding a nail to the nail holder, said last means releasing the driving pin upon advance of the carriage, means responsive to carriage movement for rocking said nail holder lever to and from operative position, an air hammer on the carriage for striking the driving pin, and pneumatic means for successively advancing the carriage and rendering the air hammer operative.

9. A nailing machine comprising a shiftable carriage movable toward and away from the work, a nail holder in the form of a pivoted lever having a notched nail receiving end and mounted on said carriage, a spring biased driving pin slidable on said carriage to engage the head of the nail, said carriage being normally in retracted position, means for actuating said driving pin away from the nail holder when the carriage is retracted to afford space for feeding a nail to the nail holder, said last means releasing the driving pin upon advance of the carriage, means responsive to carriage movement for rocking said nail holder lever to and from operative position, an air hammer on the carriage for striking the driving pin, pneumatic means for successively advancing the carriage and rendering the air hammer operative, and means operable from a position adjacent the nail holder and by pressure from the work piece to render said pneumatic means operative.

10. In a nailing machine, a base, a nail-driving carriage reciprocable on said base between a normal retracted station representing the nail-head engaging position adjacent the carriage when the nail is supported adjacent the work ready for nailing and a series of nailing stations respectively representing the successively nail-head engaging positions of the carriage as the nail penetrates the work, temporary nail support means on said carriage, said temporary support means being movable with respect to said carriage between a normal operative position in which a nail supported thereon is held in nailing

position and a withdrawn position in which said temporary nail support means is clear of said nail, means for moving said temporary nail support means from said normal operative position to said withdrawn position and vice-versa respectively upon movement of said carriage from said normal retracted station to the first of said nailing stations and vice-versa, means adjacent said retracted station for feeding a nail to said temporary nail support means, and means for so reciprocating said carriage.

11. In a nailing machine, a base, a nail-driving carriage reciprocable on said base between a normal retracted station representing a nail-head engaging position of the carriage when the nail is supported adjacent the work ready for nailing representing the successive nail-head engaging positions of the carriage as the nail penetrates the work, temporary nail support means on said carriage, said temporary support means being moveable with respect to said carriage between a normal operative position in which a nail supported thereon is held in nailing position and a withdrawn position in which said temporary nail support means is clear of said nail, means for moving said temporary nail support means from said normal operative position to said withdrawn position and vice-versa respectively upon movement of said carriage from said normal retracted station to the first of said nailing stations and vice-versa, means adjacent said retracted station for feeding a nail to said temporary nail support means, means for so reciprocating said carriage, pneumatically actuated driving means on said carriage, and means for operating said driving means upon movement of said carriage from said normal retracted station to said driving stations.

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