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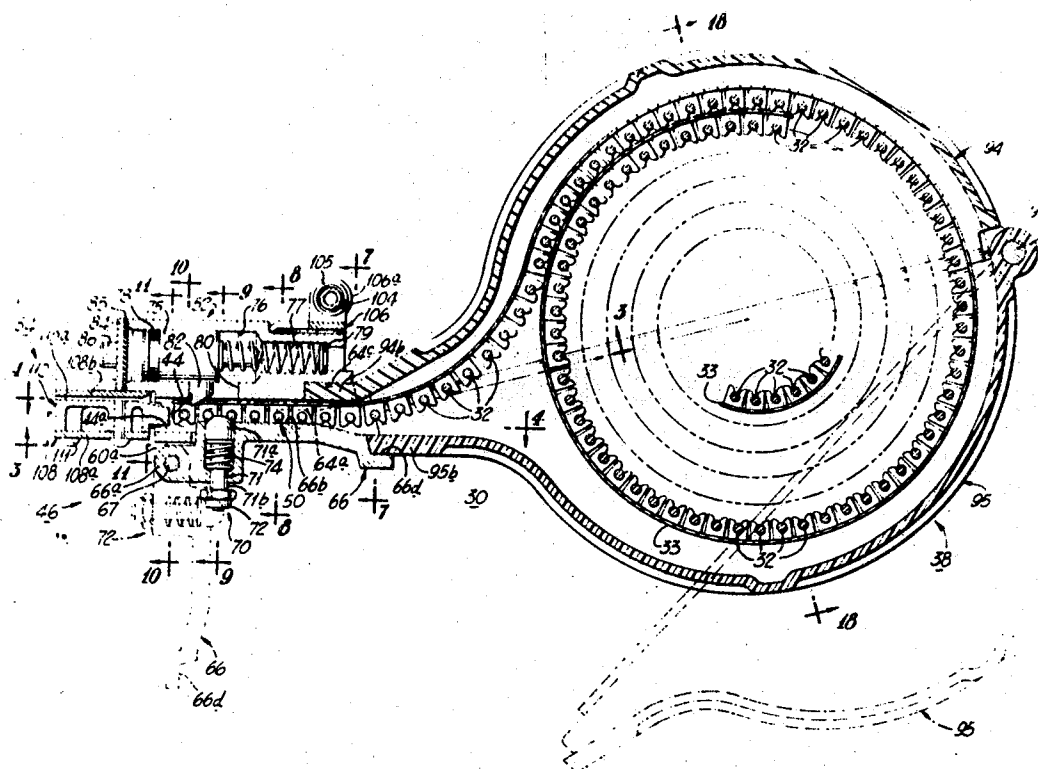
[54] **FASTENER DRIVING TOOL**
38 Claims, 25 Drawing Figs.

[52] U.S. Cl. **227/136**

[51] Int. Cl. **B25c 1/04**

[50] Field of Search **227/136**

ABSTRACT: A tool for driving a fastener mounted on an elongated, flexible, carrier strip including a drive track, a driver movable in said track, guide means for directing fasteners on said carrier strip into said drive track and pawl means projecting laterally into said guide means and movable toward and away from said drive track. The pawl means is engageable with the carrier strip on forward strokes to advance fasteners on the strip toward the drive track and is formed with a rearward, cammed surface engageable to deflect the carrier strip laterally on rearward movement without moving the strip rearwardly away from the drive track.



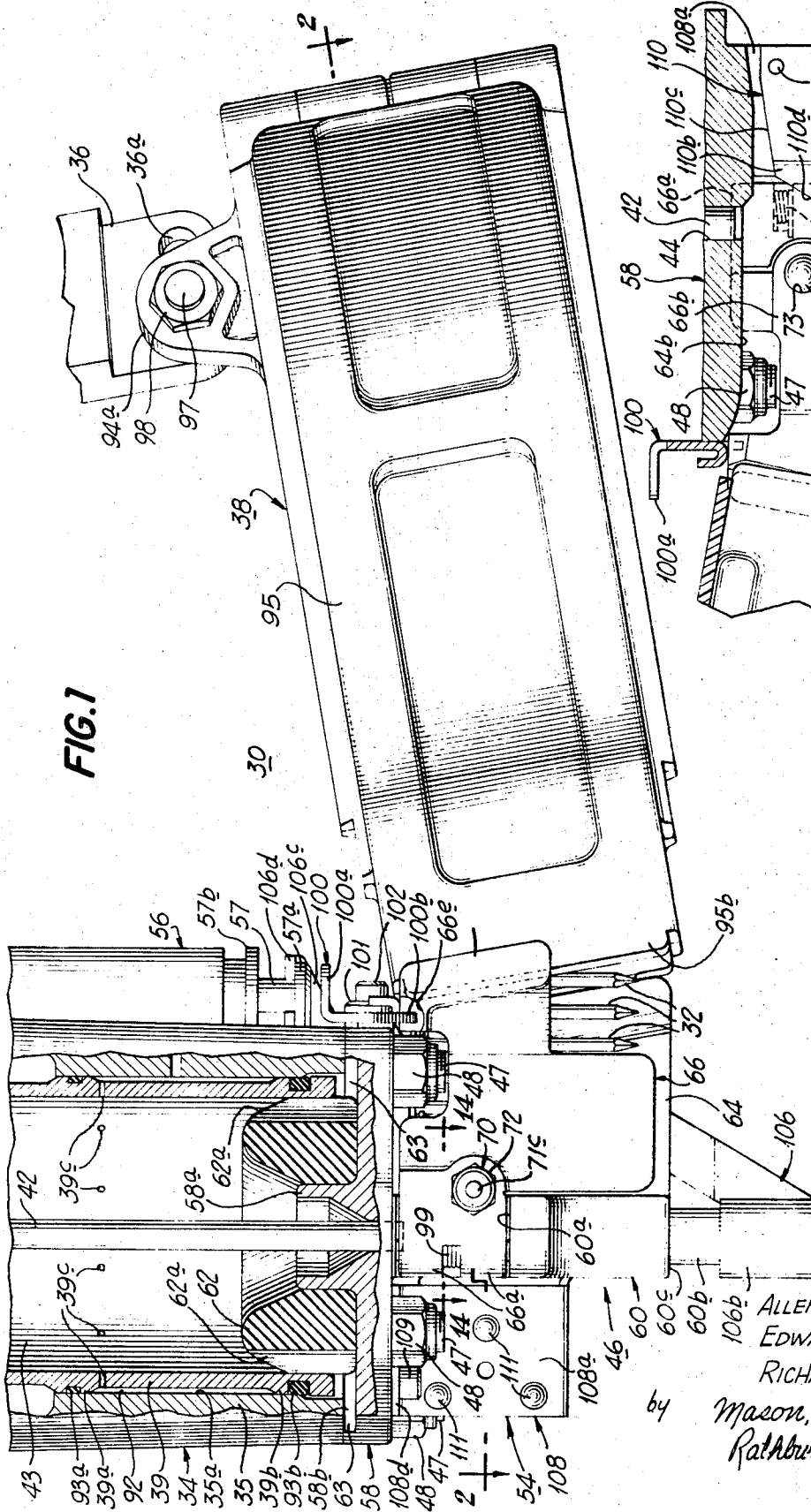


FIG. 1

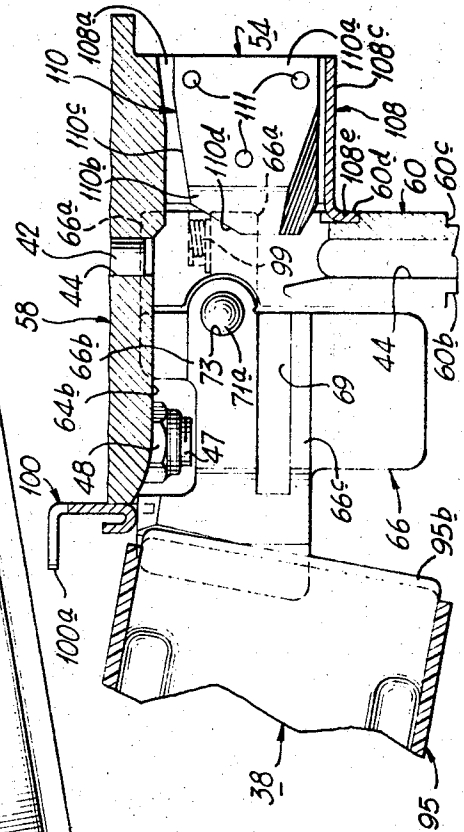
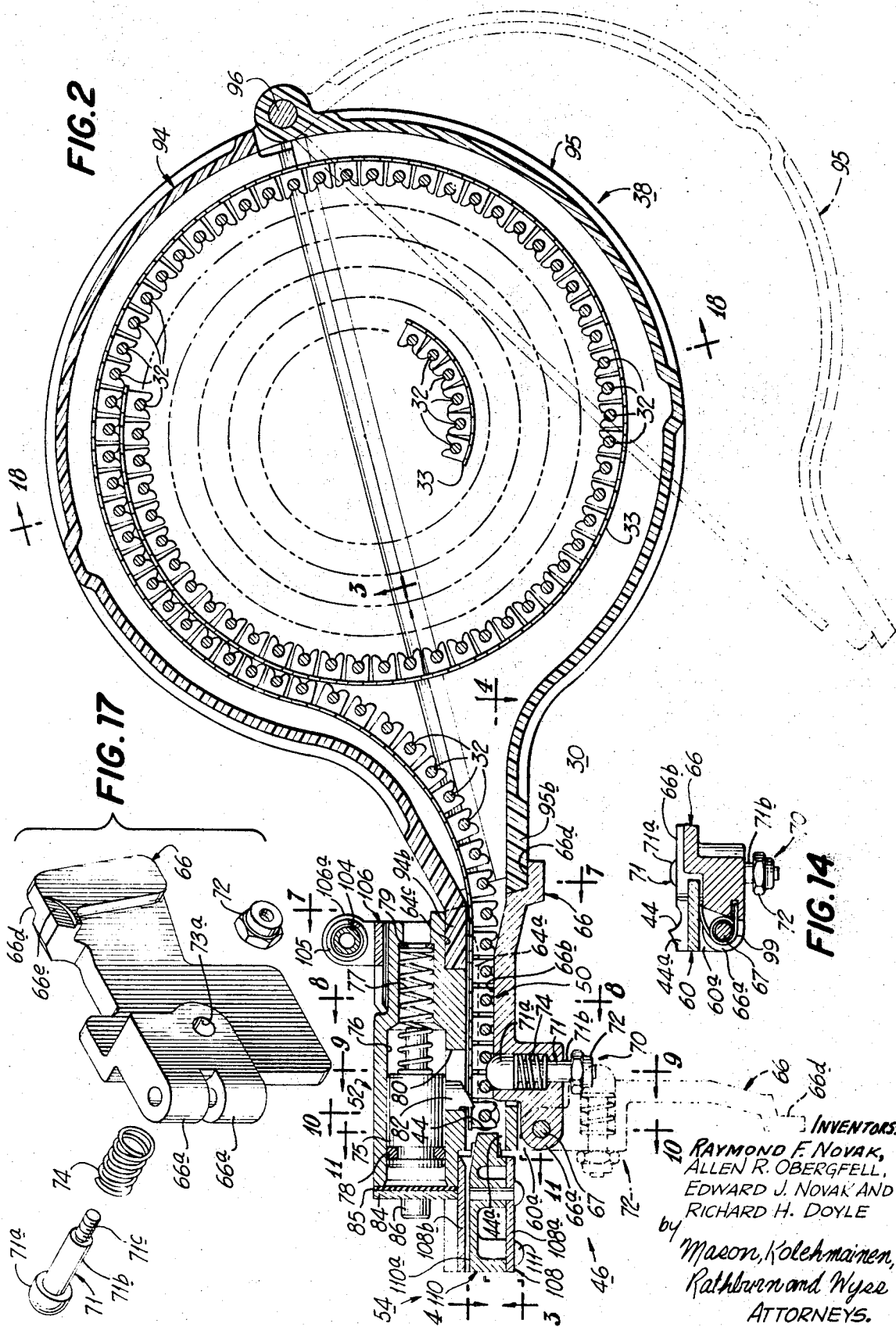
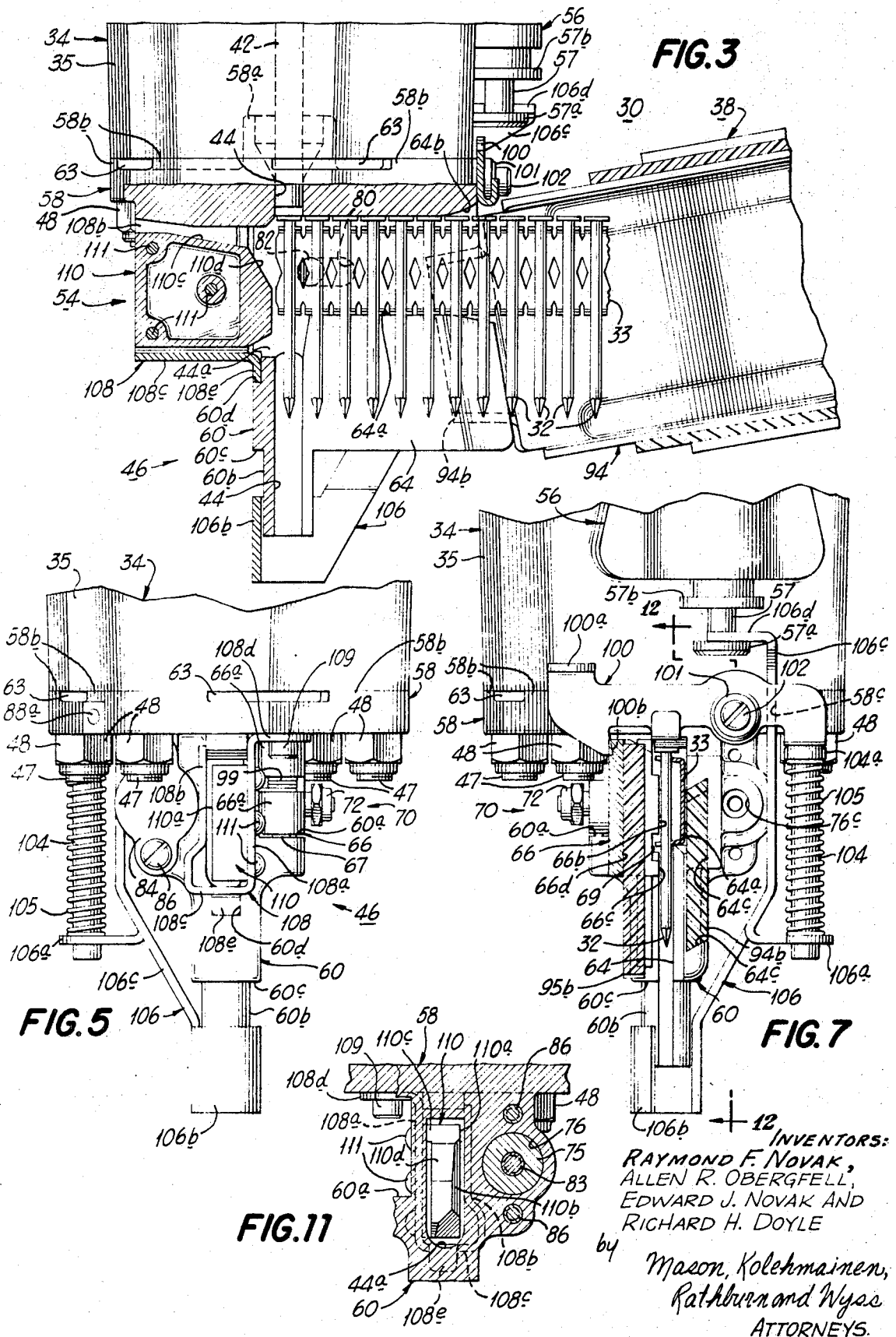


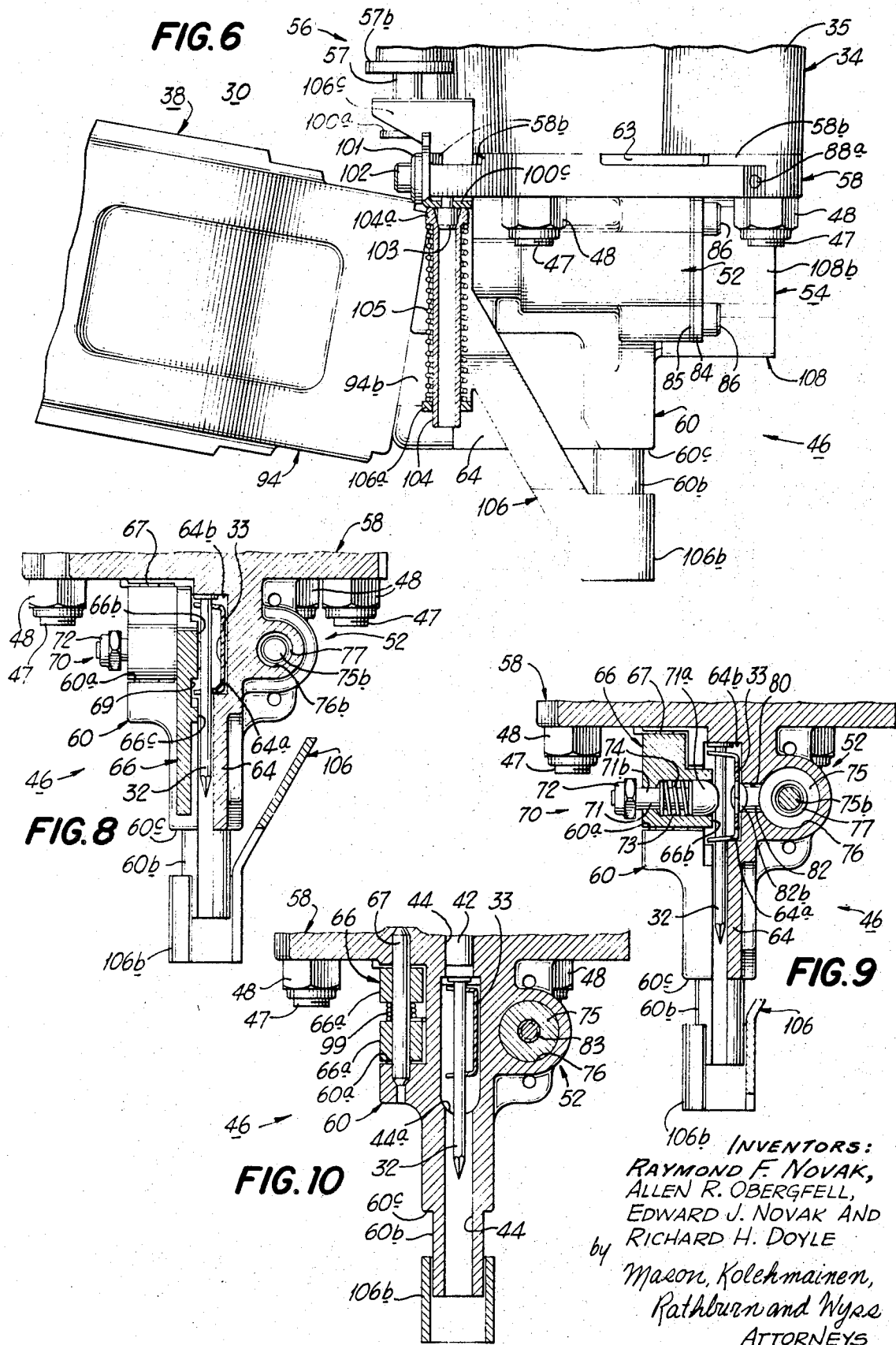
FIG. 4

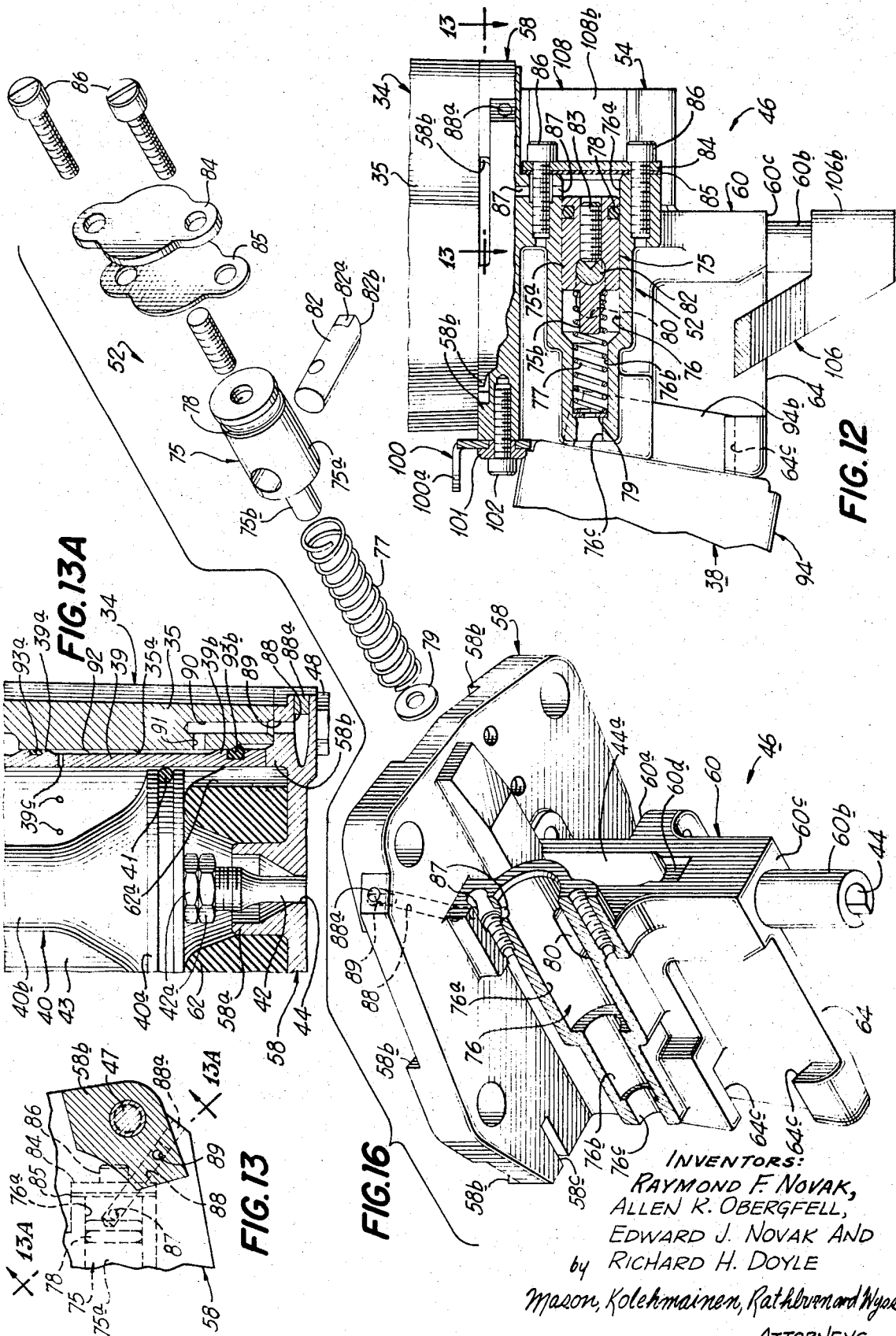
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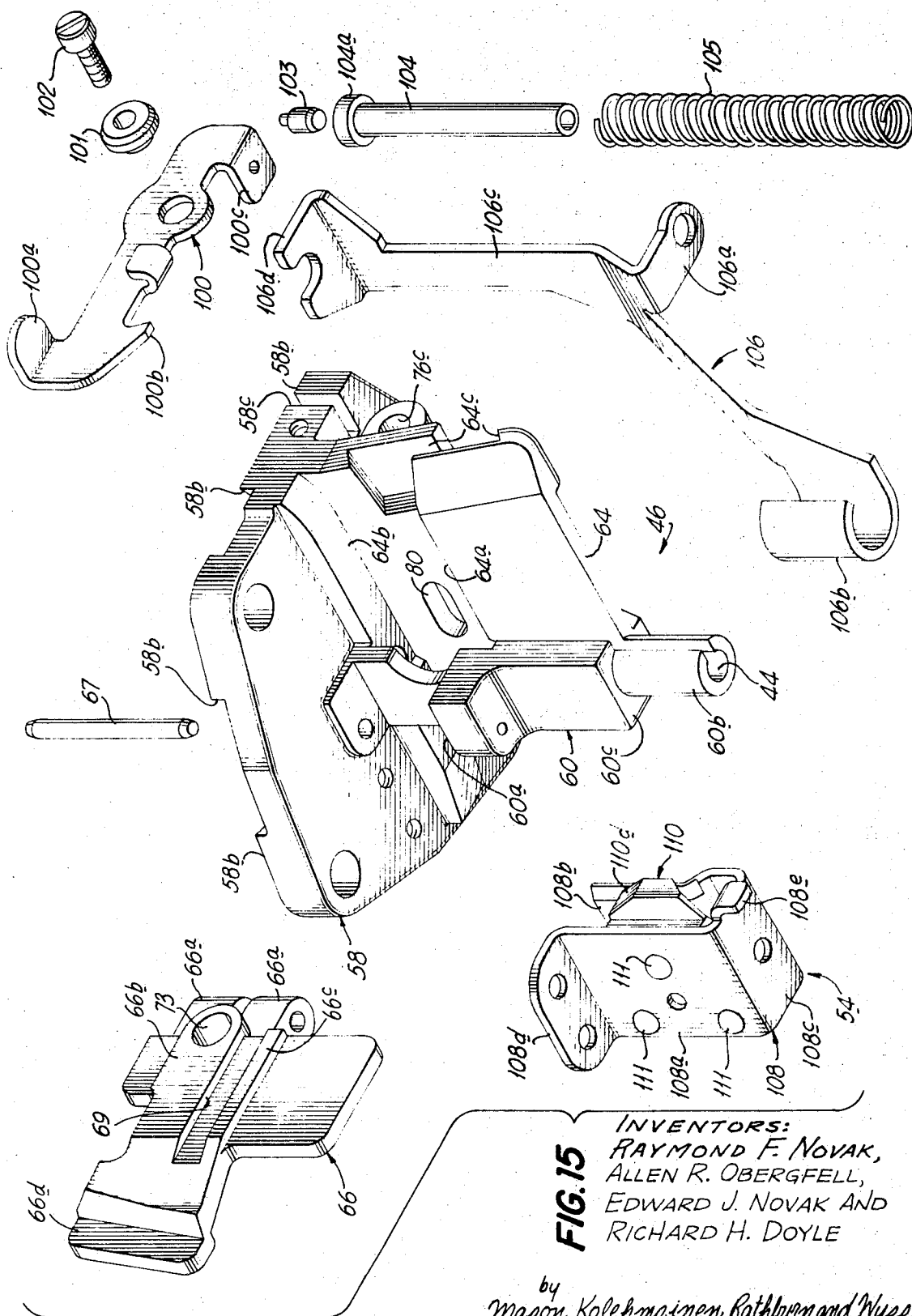
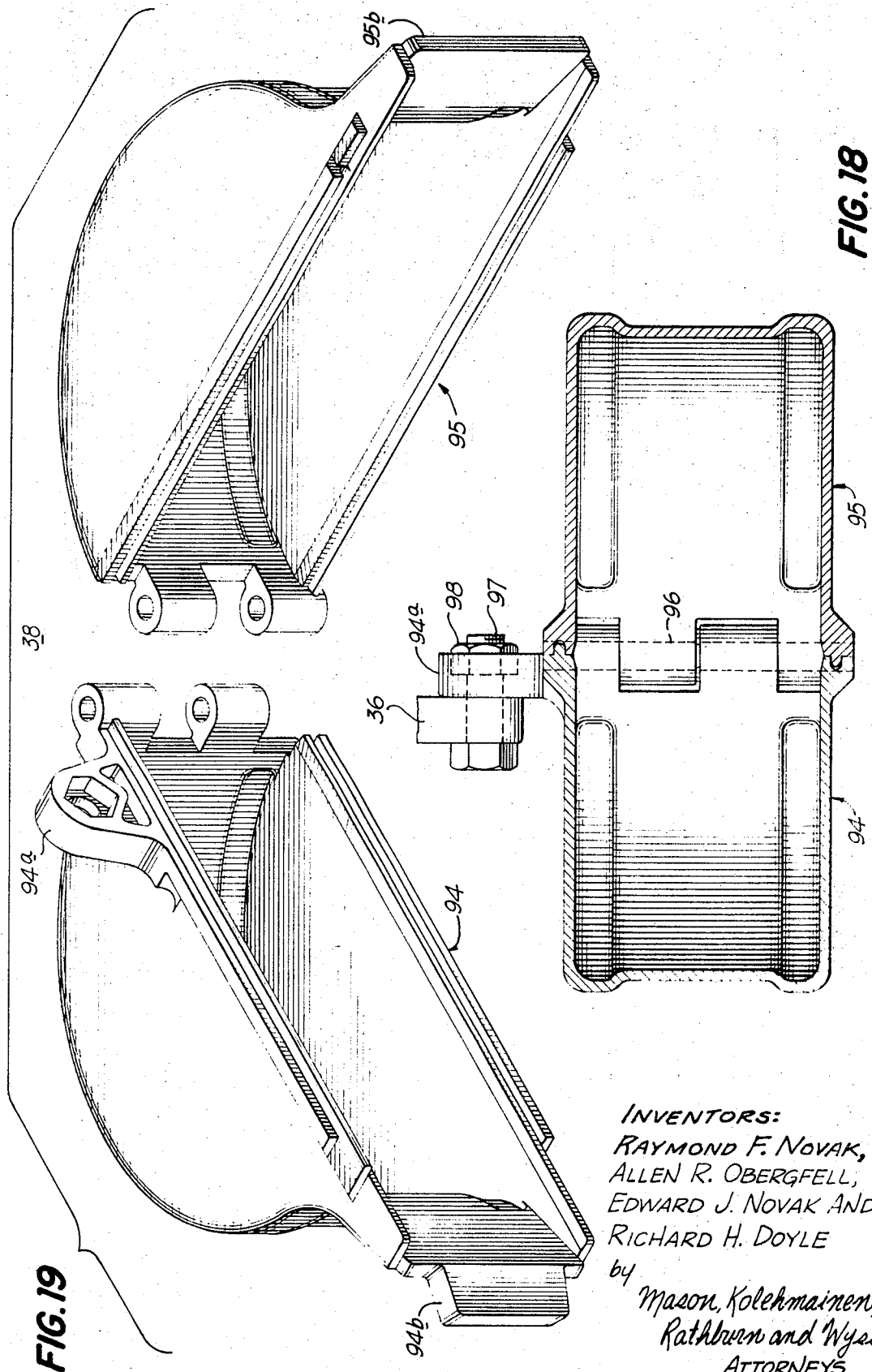
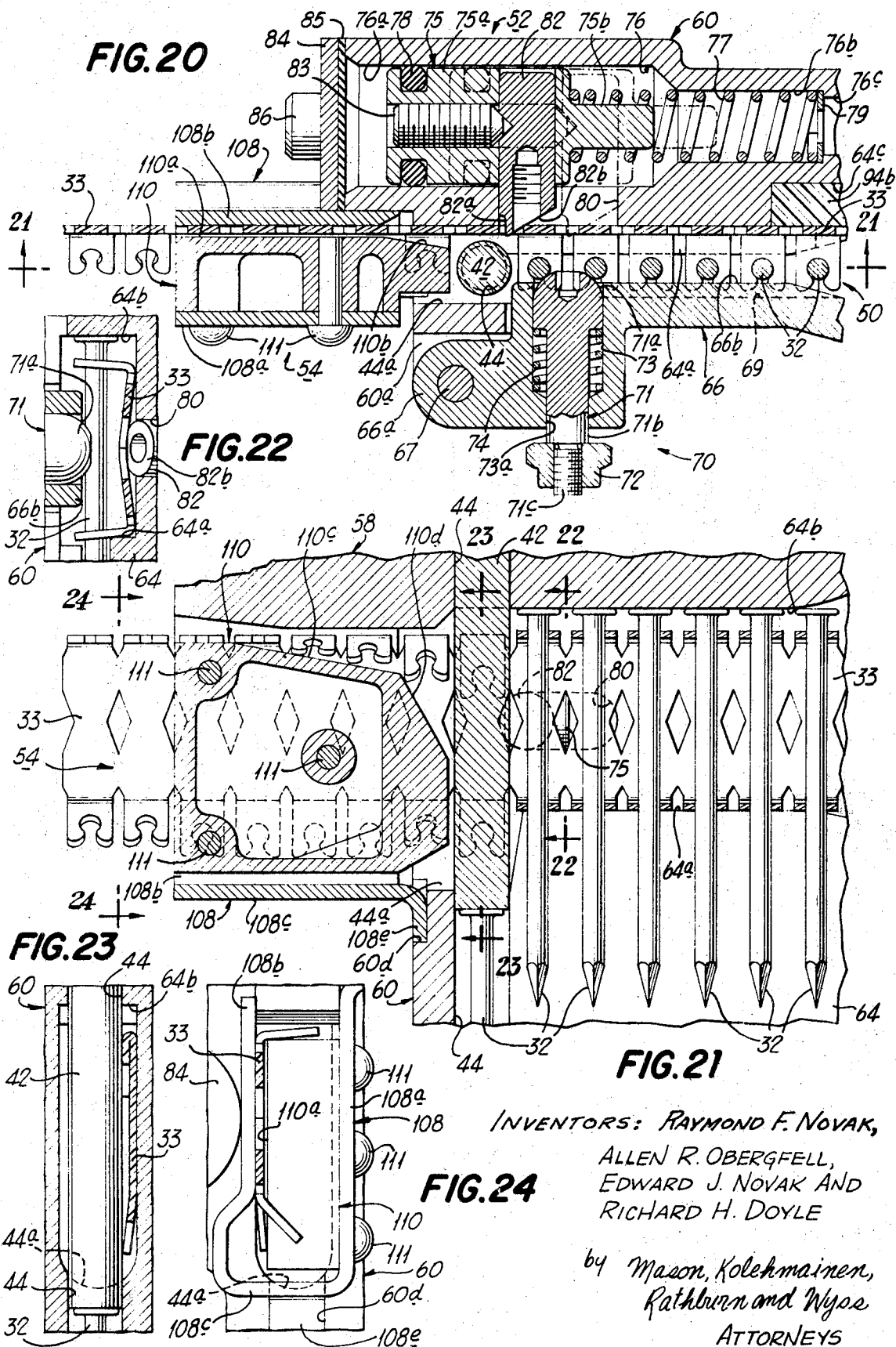


FIG. 15
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FASTENER DRIVING TOOL

The present invention relates to power operated fastener driving tools, and more particularly relates to improvements in such tools for the handling and feeding of relatively large fasteners which are to be driven thereby.

Power actuated fastener driving tools have advantages from both a labor saving standpoint and a time saving standpoint, especially in connection with the driving of heavy duty fasteners, such as common nails, and the like. Many problems have arisen in connection with heavy duty tools which are capable of driving large fasteners, such as common nails, because the tools must remain relatively small in size and light in weight for ease in handling and manipulation by an operator, yet must also be rugged and reliable in order to withstand the forces developed when driving large nails completely home in a single power stroke. The weight of the nails themselves contained in the tool is also a significant factor and tends to reduce the maneuverability or portability of the tool, especially when the tool is fully loaded with nails.

One means of reducing the weight and adding to the ease of handling such tools is by reducing the number of nails that can be initially loaded into the magazine of the tool; however, this approach has the disadvantage of requiring more frequent reloading of nails into the tool. By providing flexible, continuous carrier strips for supporting the nails which can be coiled to form a compact, cylindrical bundle or package, such as that disclosed in the copending U.S. Pat. application of Joseph Mosetich, filed Mar. 8, 1968, now U.S. Pat. No. 3,450,255, issued June 17, 1969, a relatively large number of large nails can be contained in a relatively small tool magazine, and the frequency of reloading the tool is thereby decreased.

Another problem in connection with heavy duty tools of the character described is to provide a small, lightweight tool magazine which can be opened rapidly and easily to receive new bundles of nails and, in addition, reliable means are needed for feeding and guiding the nails from the magazine into the drive track with a minimum of time being required for threading the carrier strip through the guiding means and positioning the first nail on the carrier strip in the drive track of the tool in proper position to be driven.

The present invention is concerned not only with an improved magazine construction but, in addition, is concerned with improved means for feeding the nails from the magazine into the drive track in an efficient, trouble-free manner so that the nails do not easily become jammed in the feedway or in the drive track. Moreover, should a nail jam or hang-up occur in the tool, the guideway must be capable of being easily and rapidly opened to fully expose the nails so that the impediment can be rapidly cleared.

Another problem in tools of the character described is that of supporting, feeding, and accurately aligning in the drive track each nail on the carrier strip, including the last few nails remaining at the end of the strip. In many prior art tools, when only one or two nails remain in the carrier strip, it is often possible for the strip and nails to become misaligned in the feeding system or drive track because of inadequate support for the tail end of the carrier strip, and many times this results in nails becoming wedged or jammed in the drive track when the driver is subsequently actuated on a driving stroke.

Yet another problem associated with tools of the character described is to provide a nail guiding and feeding mechanism which is operationally reliable, yet one which can be opened to fully expose the nails and permit rapid access to the interior thereof for clearing of a wedged nail or other impediment. Moreover, reliable means must be provided for permitting easy and rapid access to the interior of the feeding mechanism and guideway for the purpose of initially threading the leading end portion of the strip of a new fastener package or bundle which has been placed in the magazine forwardly therefrom into the drive track of the tool with a minimum of effort and time consumed.

Another problem associated with tools which are capable of driving large, round-headed fasteners, such as common nails,

is in providing a feed mechanism for reliably, accurately, and positively advancing the nails on the carrier strip into a driving position in the drive track and for positively supporting the nails in the drive track in accurate coaxial alignment until and after the driver is activated on a power stroke.

Another problem associated with the driving of conventional round-headed nails is in providing a tool operable with a carrier strip of flexible material which will readily release the nails as the driver engages the nailhead on a power stroke. In the past, various different complicated and complex pawl and ratchet mechanisms have been required for feeding the nails from the tool magazine into the drive track, and it is extremely desirable if an operationally reliable and less complex mechanism could be provided with a minimum number of moving parts, thereby eliminating or reducing the possibility of feeding or operational malfunctions.

It is therefore an object of the present invention to provide a new and improved power-driver fastener driving tool which is capable of driving relatively large, round-headed fasteners, such as common nails and the like, in a single power stroke.

Another object of the present invention is the provision of a tool of the character described having new and improved means for positively supporting the nails in an accurately aligned position in the drive track of the tool at all times, even when only a few nails are remaining on the tail end portion of the carrier strip.

Another object of the present invention is to provide a new and improved tool of the character described employing a new and improved magazine means which can be easily and rapidly opened and closed for permitting full and open access to the interior thereof, when desired, to enable the rapid insertion of another bundle of nails into the magazine.

Another object of the present invention is the provision of a new and improved tool having new and improved feedway means for guiding and directing the nails from the magazine into the drive track, which means can be easily and rapidly opened and closed to facilitate direct access to the nails at any time.

Another object of the present invention is to provide a new and improved fastener driving tool capable of driving fasteners of different lengths without requiring changes or adjustments in the magazine or other components of the tool when changing from fasteners of one length to fasteners of a different length.

Still another object of the present invention is to provide a new and improved fastener driving tool employing a new and improved magazine and guideway from the magazine to the drive track of the tool which is adapted to handle several different lengths of fasteners, yet provide suitable support and guidance for each different size of fastener being handled.

Yet another object of the present invention is the provision of a driving tool having new and improved means for handling nails which are supported on a flexible carrier strip and feeding the nails from the magazine to the drive track of the tool, said means having a minimum number of movable parts, thereby reducing the possibility of a feeding malfunction.

Another object of the present invention is the provision of a driving tool having a new and improved nail feeding system for feeding the nails from the magazine into the drive track, employing a rigid feed pawl with no pivotally mounted parts or components thereon which projects a fixed, lateral distance into the feedway and is reciprocal longitudinally therein, said pawl cooperating with the flexible carrier strip on which the nails are mounted to feed successive nails into the tool drive track on a forward stroke and merely deflect the strip laterally on a rearward stroke without rearward longitudinal movement thereof.

Another object of the present invention is the provision of a new and improved tool employing a unitary latch means which is releasable to permit opening of one side of the nail feedway between the magazine and the drive track and one side of the magazine housing at the same time, thereby facilitating the insertion of a new bundle of fasteners into the magazine and

feeding or threading of the leading end portion of the carrier strip supporting the nails forwardly along the feedway until the first nail on the strip is coaxially positioned in the drive track ready to be driven.

For a better understanding of the present invention, reference should be had to the following detailed description taken in conjunction with the appended claims and the drawings, in which:

FIG. 1 is a side elevational view of the lower portion of a new and improved, power actuated fastener driving tool constructed in accordance with the features of the present invention;

FIG. 2 is a sectional view through the lower portion of the tool taken substantially along line 2-2 of FIG. 1;

FIG. 3 is a sectional view taken substantially along line 3-3 of FIG. 2, illustrating in detail the guideway for delivering fasteners from the magazine into the drive track of the tool;

FIG. 4 is a fragmentary sectional view taken substantially along line 4-4 of FIG. 2 and illustrating a portion of the detachable connecting means between the magazine assembly and the feedway leading to the drive track of the tool;

FIG. 5 is a front elevational view of the lower portion of the tool;

FIG. 6 is a fragmentary, side elevational view of the tool as seen from the opposite side thereof with respect to FIG. 1;

FIG. 7 is a cross-sectional view taken substantially along line 7-7 of FIG. 2, and illustrating a novel latch means in accordance with the invention for latching the forward end of the magazine with one wall of the guideway leading from the magazine to the drive track;

FIG. 8 is a cross-sectional view taken substantially along line 8-8 of FIG. 2 through the guideway between the magazine and drive track;

FIG. 9 is a cross-sectional view taken substantially along line 9-9 of FIG. 2 at a point forwardly of the section shown in FIG. 8 toward the drive track of the tool;

FIG. 10 is a sectional view taken substantially along line 10-10 of FIG. 2 and on a plane longitudinally of the drive track of the tool;

FIG. 11 is a sectional view taken substantially along line 11-11 of FIG. 2, illustrating support means in accordance with the invention provided forwardly of the drive track for insuring proper positioning of the nails in the drive track when only a few nails are remaining in the carrier strip;

FIG. 12 is a fragmentary sectional view taken substantially along line 12-12 of FIG. 7 and illustrating the reciprocating feeder means of the tool;

FIG. 13 is a fragmentary sectional view taken substantially along line 13-13 of FIG. 12;

FIG. 13A is a sectional view taken substantially along line 13a of FIG. 13;

FIG. 14 is a detailed sectional view taken substantially along line 14-14 of FIG. 1, illustrating the support arrangement for a movable sidewall of the fastener guideway leading from the magazine to the drive track of the tool;

FIG. 15 is an exploded, perspective view illustrating individual component parts of the lower portion of the tool;

FIG. 16 is an exploded perspective view similar to FIG. 15, but viewed from an opposite direction;

FIG. 17 is an exploded perspective view illustrating individual component parts of the movable wall of the guideway assembly;

FIG. 18 is a sectional view taken substantially along line 18-18 of FIG. 2 through the magazine assembly of the tool;

FIG. 19 is an exploded perspective view illustrating the housing members of the magazine assembly in an open condition;

FIG. 20 is an enlarged fragmentary sectional view similar to FIG. 2 and illustrating the forward portion of the tool with the carrier strip in an advanced position;

FIG. 21 is an enlarged sectional view taken substantially along line 21-21 of FIG. 20;

FIG. 22 is a cross-sectional view taken substantially along lines 22-22 of FIG. 21, and illustrating in enlarged detail the engagement of the feed pawl with the carrier strip;

FIG. 23 is a fragmentary sectional view taken substantially along line 23-23 of FIG. 21 and illustrating the driver of the tool in a downward position after partially driving a nail which has been released by the carrier strip; and

FIG. 24 is an enlarged fragmentary sectional view taken substantially along line 24-24 of FIG. 21, illustrating the means for supporting the forward portion of the carrier strip ahead of the drive track.

Referring now more particularly to the drawings, therein is illustrated one embodiment of a new and improved power actuated fastener driving tool 30, especially adapted for driving relatively large, heavy duty fasteners, such as round-headed common nails 32 which are mounted in spaced parallel relation transversely of an elongated, flexible carrier strip 33, preferably of the type disclosed and claimed in U.S. Pat. No. 3,438,487, issued Apr. 15, 1969, said patent being incorporated herein and made a part hereof by reference.

The tool 30 includes a portable body 34 of relatively heavy construction because of the high forces involved when driving large nails completely home on a single stroke of the driver. The body includes a vertically extending, hollow head portion 35 at the forward end thereof and a rearwardly extending hollow handle portion (not shown), which serves as a reservoir for holding a volume of compressed air for operation of the tool and is supplied by a flexible air line connected to the rear end of the handle.

The rearward end of the handle portion of the tool body is formed with a downwardly depending, handle butt portion or lug 36 which supports the rearward end portion of a magazine 38 constructed in accordance with the present invention for holding a relatively large number of the nails 32 arranged with the carrier strip 33 in coiled configuration forming a compact, cylindrical bundle of nails, as best illustrated in FIG. 2 and as described in the aforementioned copending Moseitch application.

The hollow head portion 35 is open at its lower end (FIGS. 1 and 13A) and has an internal, cylindrical bore 35a formed therein to receive a hollow cylinder insert 39, in which is slidably disposed the lower end portion of a movable piston assembly 40 (FIG. 13A). An elongated, drive rod or driver 42 is connected to the lower end of the piston assembly 40 for sliding movement in a hollow nail passage or drive track 44 formed in a nosepiece 46 (FIGS. 15 and 16) removably mounted on the lower end of the head portion 35 by a plurality of studs 47 and nuts 48.

Individual nails on the carrier as it is uncoiled from the bundle in the magazine 38 are guided forwardly into the drive track along a feedway or guideway section 50 (FIGS. 2 and 20) and are advanced or fed, one at a time, into an axially aligned position in the drive track by a feeder mechanism 52, operable in synchronism with the driving and return strokes of the driver 42.

On a driving stroke, as the lower end of the driver engages the head of a nail 32, which has been previously positioned in the drive track and begins to move downward, the upper and lower hinge tabs of the carrier strip 33 supporting the nail are pivoted downwardly, thereby releasing the nailshank, as illustrated in FIGS. 21 and 23, and as illustrated and described in the aforementioned Moseitch application. After the nail has been driven fully home into a workpiece placed below the nosepiece, the driver is returned upwardly to a rest position and the next nail on the carrier strip in the feedway is advanced forwardly into an axially aligned position in the drive track by the feeder mechanism 52. As successive nails are driven, the empty portion of the carrier strip moves forwardly, out of the drive track and is guided outwardly from the nosepiece by a forward strip support assembly 54 (FIGS. 2 and 15). After the last nail on the carrier strip has been driven, or when only a single nail remains on the carrier strip in the tool, the magazine and feedway section are unlatched and

opened up (FIG. 2, dotted lines) and another package or bundle of nails is placed in the magazine. The leading or outer end portion of the carrier strip is uncoiled from the bundle and is threaded forwardly along the open feedway until the first nail in the strip is coaxially centered in the drive track or is positioned just behind the last nail remaining in the previous carrier strip. The feedway and magazine are then closed and latched and operation of the tool is continued until the nails on the new carrier strip have been exhausted, and then reloading and threading of the leading portion of the new carrier strip through the feedway 50 is repeated as before.

As previously mentioned, the handle portion of the tool body 34 forms a reservoir for holding a volume of compressed air for operation of the tool and the tool includes suitable poppet valve means (not shown) in the upper end of the head portion operable to supply compressed air to the upper end of the piston assembly 40 for moving the piston rapidly downward on a driving stroke when desired by the operator of the tool. Suitable poppet valves for this purpose are shown and described in U.S. Pat. Nos. 3,208,353 and 3,498,517, the specifications and drawings of which are incorporated herein by reference. At the completion of a driving stroke, the piston assembly and driver 42 are moved upwardly on a return stroke to an upper or rest position and remain in this position until the next activation of the valve means is accomplished to initiate another driving stroke.

For the purpose of returning the piston assembly 40 and driver 42 to the upper or rest position after a drive stroke has been completed, the piston assembly includes a lower piston head 40a slightly smaller in diameter than the internal bore of the cylinder insert 39 and a hollow, coaxial stem 40b is integrally formed with the lower piston head and extends upwardly thereof in the cylinder. The stem 40b is substantially smaller in diameter than the internal bore of the cylinder insert, and an upper piston head (not shown) slightly larger in diameter than the lower piston head 40a is integrally formed at the upper end of the stem. The piston assembly 40 is thus substantially similar to the one shown in the above-mentioned U.S. Pat. No. 3,498,517, and in order to seal between the outer periphery of the lower piston head and the internal bore surface of the cylinder insert, an O-ring 41 is seated in an annular groove around the outer edge of the lower piston head, and a similar O-ring is mounted on the upper piston head (not shown). An annular piston chamber 43 is thus formed within the cylinder insert 39 around the stem 40b, and this chamber is continuously supplied with compressed air from the reservoir in the handle of the tool body through one or more ports (not shown) formed in the cylinder insert. Because the upper piston head is slightly larger than the lower piston head 40a, the compressed air within the chamber 43 acts with a net resultant upward force on the piston assembly, causing it to move upwardly on a return stroke after each power stroke has been completed and the compressed air acting on the upper surface of the piston head has been exhausted.

The tool 30 includes a trigger and safety valve mechanism for controlling the operation of the poppet valve at the upper end of the head portion, and the poppet valve, in turn, initiates a power stroke of the piston assembly 40. A suitable trigger and safety valve assembly is disclosed in the copending U.S. Pat. application Ser. No. 767,020, filed Aug. 26, 1968, now abandoned, the specification and drawings of which are hereby incorporated in and made a part hereof by reference. A trigger and safety valve mechanism 56 (FIGS. 1 and 7), preferably of the type disclosed in the above application, is detachably mounted on a rearwardly facing, external surface on the lower head 35 of the tool body. This valve mechanism 56 includes a depending operator or safety valve stem 57 having a flange 57a formed at the lower end, and when the valve stem is in a lower or safe position, as illustrated in the drawings, the safety valve of the mechanism prevents the initiation of a driving or power stroke of the piston assembly 40 and driver 42. When the valve stem moves upwardly from the lower or safe position to an upper or fire position (not shown),

the safety valve no longer prevents a driving or power stroke from being initiated, and when the trigger of the tool (not shown) is depressed, the piston and driver move rapidly downward to drive a nail.

In accordance with the present invention, the nosepiece 46 (FIG. 15) includes an integral flange 58 at the upper end of the drive track and a downwardly depending body portion 60, in which the drive track is defined. The drive track 44 guides the driver 42 and the nails 32 as they are driven into a workpiece placed below the lower end of the body portion and is in coaxial alignment with the central, longitudinal axis of the cylinder insert 39 in the tool body.

In accordance with the invention, the nails 32 mounted on the flexible carrier strip 33 are advanced forwardly from the magazine 38 through the feedway section 50 and are fed one at a time into the drive track 44. Each time a power stroke is initiated, the forwardmost nail on the carrier strip, which has been previously axially aligned in the drive track, is forcefully ejected downwardly and driven home into a workpiece positioned beneath the lower end of the drive track. Because the driver 42 is subjected to repeated and relatively high stress applications as the nails are driven, the driver is detachably connected to the lower end of piston assembly 40 and a driver may be replaced if need be, independent of replacement of the entire piston assembly.

As shown in FIGS. 1 and 13, the upper flange 58 of the nosepiece is formed with an upwardly projecting, annular ring or flange 58a in coaxial alignment with the upper end of the drive track 44 and the ring defines with a frustoconical recess adapted to accommodate the upper end portion of the driver 42 and a pair of nuts 42a (FIG. 13A) used to secure the driver to the lower end of the piston assembly 40.

In order to cushion the force of the piston assembly as it reaches the end of a power stroke and prevent the lower piston head 40a from striking the upper surface of the nosepiece flange 58, an annular, doughnut-shaped, shock absorber 62 of resilient material is mounted on the upper surface of the flange within the cylinder 39 around the annular ring 58a. The shock absorber is formed with a plurality of longitudinally extending flutes or grooves 62a spaced around the outer edge to permit the air within the cylinder insert 39 beneath the lower piston head 40a to flow freely out of or into the lower end of the head portion 35 during a driving or return stroke of the piston assembly. The upper flange 58 of the nosepiece is formed with a plurality of spaced apart lugs or projections 58b (FIGS. 13, 15, and 16) extending upwardly from the upper surface of the central portion of the flange, and each projection has a flat upper surface adapted to bear against the annular lower end surface of the head portion 35 of the tool body, thereby defining a plurality of radially spaced exhaust ports 63 which are in communication with the outer grooves 62a in the shock absorber. Because of the grooves 62a in the shock absorber and the ports 63, the lower end of the cylinder is maintained at atmospheric pressure on both power and return strokes of the piston assembly 40. The flange 58 is secured in place on the lower end of the head portion 35 by the threaded studs 47 and nuts 48, and the nosepiece can be easily removed from the tool body by loosening the nuts and withdrawing the nosepiece downwardly. As shown in FIGS. 13A, 15, and 16, the studs 47 project downwardly through aligned holes formed in the lugs 58b on the upper surface of the nosepiece flange 58.

In accordance with the present invention, after each new cylindrical package or bundle of nails 32 has been inserted into the magazine assembly 38, the outer or leading end portion of the strip is uncoiled and is threaded through the guideway section 50 until the first nail in the strip is coaxially centered in the drive track 44 of the nosepiece 46. The feedway section includes a fixed wall portion 64 integrally formed on the nosepiece extending downwardly from the upper flange 58 and rearwardly from the drive track 44. The rearward end portion of the wall 64 is adapted for detachable connection with the forward end of the magazine assembly 38 and the wall

is provided with a longitudinal guide channel or groove 64a (FIG. 15) extending transversely rearward from the drive track for supporting and guiding the carrier strip 33 as it is threaded or advanced forwardly toward the drive track (see FIGS. 8, 9, and 15). As described in the aforementioned copending U.S. application of Mosetich et al., the carrier strip is constructed of flexible plastic material and is generally channel shaped in cross section, including a web portion and rows of spaced apart, hinge tabs transverse thereto along the upper and lower longitudinal edges of the web for supporting the shanks of the nails. The web portion of the carrier strip is formed with a series of longitudinally spaced apart, diamond shaped openings, spaced between the shanks of adjacent pairs of nails, as best shown in FIG. 21. The lower row of hinge tabs on the carrier strip is supported on the lower surface of the channel or groove 64a formed in the wall 64 and the web portion of the carrier is adapted to slide along the lateral sidewall of the groove with the heads of the nails positioned beneath the upper surface of the groove, which is defined by the lower surface of an integral rib 64b projecting downwardly from the lower surface of flange 58 and extending rearwardly of the drive track along the feedway. The rearward end portion of the rib 64b is curved upwardly (FIGS. 3, 4, 15, and 21) to aid in guiding the heads of the nails 32 into the groove or channel 64a from the forward end of the magazine assembly 38, which slopes upwardly and rearwardly with respect to the longitudinal or horizontal axis of the groove.

The feedway section 50 includes a movable wall member or gate 66 (FIG. 17) which is pivotally mounted on the nosepiece body 60 by a pivot pin 67 (FIG. 15) parallel to and laterally offset adjacent the drive track 44. The gate 66 is pivotable about the pin 67 between a closed position, as shown in solid lines in FIG. 2, wherein the inside surface of the gate is in facing parallel relation with the fixed wall 64 and an open position, shown in dotted lines in FIG. 2, wherein substantially all of the inside surface of the fixed wall and groove 64a are fully exposed. Thus, when the gate 66 is open, the forward end or leading end portion of the carrier strip 33 and the nails 32 which are in the feedway thereon are exposed for ready access. As best shown in FIG. 15, the movable wall or gate 66 includes a pair of forwardly extending, spaced apart, projections 66a having aligned holes drilled therein for accommodating the pivot pin 67, and the body portion 60 of the nosepiece is formed with a lateral recess 60a (FIGS. 2, 5, and 10) adjacent the drive track for accommodating the projections 66a of the gate member. The upper and lower ends of the pivot pin 67 are journaled in a pair of coaxially aligned holes formed in the nosepiece body above and below the recess 60a (FIGS. 10 and 15).

The main body portion of the gate 66, rearwardly of the projection 66a, is offset laterally inwardly toward the fixed wall 64 to define a narrow feedway for the nailshanks and is formed with a pair of spaced apart longitudinal ribs 66b and 66c thereon defining a groove 69 therebetween for accommodating the outer ends of the lower row of hinge tabs on carrier strip 33 (FIGS. 7 and 8). The ribs 66b and 66c guide and direct the shanks of the nails 32 into lateral alignment with the drive track as the nails are advanced in the feedway section 50 forwardly and limit the lateral movement of the nails as feeding proceeds.

When the leading end portion of the carrier strip 33 and nails 32 thereon are inserted into the feedway section 50, the web portion of the carrier strip is seated in the groove 64a in the fixed wall 64 and is thereby guided toward the drive track. The ribs or ridges 66b and 66c on the gate 66 guide the shanks of the nails from the opposite side of the feedway above and below the lower row of hinge tabs on the carrier strip (FIGS. 8 and 10) and thereby limit the outward lateral movement of the strip in the feedway away from the fixed wall 64 so that the web of the strip may not become disengaged from the longitudinal groove 64a in the fixed wall until the gate 66 is opened.

In order to further insure that the web of the carrier strip is properly seated in the groove 64a with the outer side of the

web moving against the lateral sidewall of the groove and thereby to insure that proper engagement between the diamond shaped openings in the web and a feed pawl of the feeder mechanism 52 is effected, a detent plunger or backup pawl assembly 70 is mounted on the gate 66 just rearwardly of the drive track 44 (FIG. 20). The backup pawl assembly includes a plunger 71 having an enlarged, rounded head portion 71a at the inner end adapted to directly engage the shanks of the nails 32 and bias the nails and strip laterally inward in the feedway toward the fixed sidewall 64, as best shown in FIGS. 2 and 20. The plunger includes an intermediate shank portion 71b of reduced diameter and a threaded outer end portion 71c on which is threaded a stop nut 72 for limiting the amount of inward travel of the plunger head by engagement with the outer surface of the gate 66. The plunger is mounted for transverse lateral movement on the gate 66 in a shouldered bore 73 provided therein having an outer segment 73a of reduced diameter for accommodating the shank portion b. A coiled biasing spring 74 is mounted on the plunger shank within the bore 73 for biasing the head portion 71a inwardly against the nailshanks when the gate 66 is in a closed position, as shown best in FIG. 20. The rounded end portion of the plunger head 71a is adapted to seat between and against the shanks of the pair of nails 32 next rearwardly adjacent the drive track 44 and thereby centers the first or leading nail on the carrier strip in a coaxially aligned position in the drive track ready to be driven by the driver 42.

In addition to the function of maintaining the carrier strip 33 within the groove 64a during feeding, the engagement between the plunger head 71a and the nailshanks serves to accurately position the nails longitudinally in the feedway and insure that the leading nail on the strip is aligned with the longitudinal axis of the drive track. The plunger 71 also prevents rearward movement of the nails and carrier strip in the feedway as the feed pawl of the feeder mechanism 52 moves on a rearward or return stroke, as will be described hereinafter.

During a feeding or forward stroke of the feed pawl, the nail engaging the rear side of the plunger head 71a is forced forwardly past the plunger head toward the drive track by momentarily camming the plunger head outwardly against the bias of the spring 74. When the movable gate 66 is pivoted outwardly to open the feedway (dotted lines, FIG. 2), however, the plunger head moves away from the nails and the nails and carrier strip can be freely withdrawn, advanced or moved rearwardly in the feedway.

In accordance with the present invention, the feeding mechanism 52 of the tool includes a reciprocating feeder piston 75 which is mounted for sliding movement in a cylinder or bore 76 formed in the body portion 60 of the nosepiece 46. The bore 76 includes a forward portion 76a and a rearward portion 76b of reduced diameter which is vented to the atmosphere through an end port 76c at the rear. The longitudinal axis of the bore extends transversely of the drive track and is laterally offset therefrom, and, in addition, is parallel to and laterally offset from the longitudinal center axis of the feedway section 50 or groove 64a. The feeder piston includes an enlarged diameter head portion 75a slidable in the forward bore section 76a with an O-ring 78 mounted thereon and a reduced diameter rearwardly extending stem 75b around which is seated the forward end of a coiled compression spring 77 which normally biases the piston to a forward position in the bore, as shown in FIG. 20. The rearward end of the spring extends into the reduced diameter rearward bore section 76b and is seated against a stop washer 79 at the rear end around the port 76c. When compressed air is introduced in the forward bore section 76a against the piston head 75a, the piston is moved rearwardly in the cylinder against the force of the spring 77 to the rearward position shown in dotted lines in FIG. 20, and when the pressure in the forward end of the bore is released, the compressed spring moves the piston forwardly on a feeding stroke to feed or advance the next nail on the carrier into the drive track.

The bore 76 is in communication with the interior of the feedway section 50 through an elongated slot 80 formed in the fixed wall member 64 just rearwardly of the drive track 44 along a horizontal plane coextensive with the longitudinal axis of the bore 76 and midway between the upper and lower hinge tabs on the carrier strip in the groove 64a. A feed pawl 82 is fixedly or rigidly mounted on the feeder piston 75 to extend laterally transverse thereof outwardly through the slot 80 into the feedway section 50. The feed pawl includes a cylindrical shank portion seated in a laterally transverse passage or bore formed in the piston and intersecting the longitudinal axis thereof and the feed pawl is held firmly in place by a threaded setscrew 83 mounted in an axial threaded bore formed in the forward end portion 75a of the feeder piston. The setscrew is easily removed from the feeder piston for replacement of the feed pawl if necessary, and the inner end of the setscrew is provided with a pointed frustoconical surface for engagement with a similarly shaped recess on the forward side of the shank of the feed pawl, thereby insuring that the feed pawl is properly orientated on the piston and with respect to the feedway and drive track of the tool. From the above description, operation is believed clear.

As best shown in FIGS. 20 and 22, the outer end portion of the laterally extending feed pawl 82 is adapted to move back and forth within the elongated slot 80 and engagement between the pawl and opposite ends of the slot limits the length of the stroke of the feeder piston 75. The outer end or tip portion of the feed pawl, which projects laterally into the feedway section 50 through the slot 80 is always a constant distance inwardly from the lateral face of the groove 64a as the pawl moves longitudinally of the feedway. The amount of lateral projection into the feedway is sufficient to insure that the pawl may fully extend into the diamond shaped slots and through the carrier web. The pawl is formed with forward edge faces 82a (FIG. 20) normal to the web which are adapted to engage the forward edges of the diamond-shaped slots and move the carrier forwardly an amount equal to the spacing between adjacent nailshanks when the piston 75 is advanced on a feeding stroke from the rearward position (as shown in dotted lines in FIG. 20) to the forward position shown in solid lines. The outer tip portion of the feed pawl also includes a rearwardly facing cam surface 82b sloped angularly rearwardly and laterally outward of the longitudinal axis of the feedway. When the pawl 82 is moved on a rearward stroke from the forward end of the slot 80 to the rearward end, the cam surface 82b contacts the rearward edge of the adjacent diamond shaped slot in the carrier strip and, because of the slope, momentarily cams the flexible web inwardly toward the center of the feedway away from the lateral surface of the groove 64a, as shown in FIG. 22. During this time, the plunger head 71a is engaged with the nails 32 on the opposite side of the web and exerts enough holding force to prevent the carrier and nails from moving rearwardly in the feedway with the feed pawl 82. Because the carrier 33 is constructed of flexible plastic material, the web is readily deflected from the sidewall of the groove momentarily during a rearward stroke until the forward edges 82a of the pawl have moved rearward of the next diamond shaped opening in the web. When this occurs, the carrier web springs back to its normal position against the side surface of the groove 64a and the outer tip portion of the feed pawl 82 is then firmly seated in the diamond shaped opening in the web ready for the next forward feed stroke of the piston 75. Subsequently, as the pressure in the forward end of the bore 76 is released, the compressed spring 77 biases the piston forwardly and the carrier is moved by the pawl to feed the next nail into the drive track.

On a forward or feeding stroke, the longitudinal restraining force exerted on the nails by the detent plunger 71 is overcome by the forward force exerted on the carrier web by the forward laterally transverse surfaces 82a on the feed pawl tip, and the plunger head is biased outwardly by the nails momentarily until the next nail is centered in the drive track. Because of the right angle between the forward surfaces 82a of the feed

pawl and the web, there is little or no tendency for the web of the carrier to be deflected from the groove 64a on a feeding stroke, and the feeding of each nail into the drive track is positive and accurate even though the carrier is formed of flexible material. On a rearward stroke, because of the sloping angular relation between the rearward feed pawl surface 82b and the carrier web, momentary inward flexure of the web away from the side of the groove 64a is achieved without rearward longitudinal movement of the carrier and nails in the feedway.

Because of this unique construction and the cooperation between the rigid, laterally extending feed pawl 82 and the web of the flexible carrier strip 33, no articulated finger, biasing springs, or complex pawl and ratchet mechanisms are required, as in prior arrangements. Moreover, the feeding of nails is accurate and positive, even though the carrier is constructed of flexible material and the overall construction of the feed mechanism is greatly simplified. If the tip or outer end portion of the feed pawl becomes worn, the pawl is easily replaced, as is the feeder piston itself. The longitudinal slot 80 in the wall 64 guides the feed pawl during reciprocation, preventing axial rotation of the feeder piston, and positively limits the length of the feeding and return stroke, and the mechanism is extremely dependable and reliable in operation.

The forward end of the enlarged segment 76a of the feeder piston bore is closed and sealed by a removable cover plate 84 and gasket 85 held in place by a pair of cap screws 86 which are threaded into appropriately positioned threaded bores in the nosepiece body portion 60 above and below the feeder piston. In order to supply compressed air into the forward end of the feeder piston bore section 76a to move the feeder piston 75 rearwardly, the threaded bore accommodating the upper one of the cap screws 86 is enlarged adjacent the outer end portion (FIGS. 12 and 16) to permit compressed air to flow around the shank of the cap screw and through a vertical, drilled passage 87 having its lower end in communication with the forward bore section 76a ahead of the front end of the feeder piston 75. The upper end of the passage is in communication with a horizontal drilled passage 88 formed in the flange portion 58 of the nosepiece, and the outer end portion of the passage 88 is in communication with the lower end of another vertically extending, drilled passage 89 (FIGS. 13 and 13a) formed in one of the upwardly projecting lugs 58b. The horizontal passage 88 is drilled inwardly from the outer edge of the flange 58 to intersect the upper end of the lower vertical passage 87, and the outer end of the horizontal passage is closed from the atmosphere by a plug insert 88a (FIG. 13a) outwardly of the upper vertical passage 89 which terminates on the upper end surface of the lug or projection 58b.

When the nosepiece 46 is assembled onto the lower end of the head portion 35 of the tool body and the nuts 48 on the studs 47 are tightened, the upper end of the vertical passage 89 is in sealed communication with the lower end of a vertical supply passage 90 formed in the wall of the head portion outwardly of the main bore 35a. The upper end of the supply passage 90 is in communication with a short horizontal passage 91 extending radially inward to the bore 35a in the head portion above the lower end and in communication with an annular air chamber 92 formed around the outer surface of the cylinder insert 39 between a pair of vertically spaced annular ridges 39a and 39b which are sealed against the surface of the bore 35a by suitable O-rings 93a and 93b. Compressed air is supplied to the chamber 92 from the interior of the cylinder 39 through a plurality of radially spaced ports 39c formed in the wall of the cylinder and spaced above the lower end. When the piston assembly 40 is in the upper or rest position, the lower piston head 40a is above the ports 39c and these ports are thus in communication with the lower end portion of the cylinder which is vented to the atmosphere, as previously described. Accordingly, the forward section 76a of the feeder piston bore ahead of the piston 75 is at atmospheric pressure through the passage communication, as previously described. When the piston assembly 40 moves downwardly in the cylinder 39 on a power stroke and the lower piston head

40a moves below the ports 39c, compressed air within the annular piston chamber 43 flows through the ports 39c into the outer chamber 92 and through the described passages into the forward section 76a of the feeder piston bore, thus moving the feeder piston and pawl rearwardly. After a power stroke has been completed and the piston assembly 40 is returned upwardly, the lower piston head 40a moves above the ports 39c, permitting the forward end section of the feeder piston bore to be exhausted to the atmosphere. When this occurs, the feeder piston and pawl 82 are moved forwardly on a feed stroke by the spring 77, thus feeding the next leading nail 32 on the carrier strip into the drive track 44. It can thus be seen that the feeder mechanism 52 operates automatically in synchronism with the piston assembly and driver 42 to feed a new nail into the drive track on each return stroke of the tool.

In accordance with the present invention, the magazine 38 (FIGS. 1, 2, 18, and 19) is adapted to hold a relatively large number of the nails 32 arranged in a substantially cylindrical package or bundle supported on the carrier strip which is tightly coiled, as shown in FIG. 2, and in the aforementioned Moseitch application. The magazine assembly supports the nails as the carrier strip is slowly uncoiled as successive nails are driven, and it should be noted from FIG. 1 that the bottom and top surfaces of the magazine slope rearwardly and upwardly with respect to the longitudinal or horizontal axis of the feedway 50, so that the tool 30 may be used for toe-nailing operations.

The forward end portion of the magazine is detachably connected with the rearward end of the feedway section 50 of the tool and guides the nails smoothly into the feedway as the carrier strip is slowly uncoiled in the magazine. Because most of the nails in the tool are held in the compact bundle in the magazine, as successive nails are driven, the center of gravity of the nail bundle does not materially change, and, accordingly, the feel or handling of the tool is not affected appreciably.

When the magazine is in a closed condition, it is substantially cylindrical in shape and includes a pair of cooperating hollow, semicylindrical housing members 94 and 95 which are hingedly connected at the rear end by a hinge pin 96. Each of the housing members includes a top wall and a bottom wall spaced therefrom of substantially semicircular shape and a curved peripheral sidewall extending from the hinge pin to the forward end of the magazine for connection with the rearward end of the feedway section 50.

The forward or exit end of the magazine assembly includes a forwardly projecting throat portion formed by the sidewalls of the respective housing members to guide the fasteners on the carrier 33 forwardly into the feedway section, as best shown in FIG. 2. The diametrically disposed mating edges of the top and bottom walls of the respective housing members 94 and 95 are provided with matching ridges and grooves which serve to tightly seal and enclose the magazine when the two housing members are closed together. At the rearward end portion of the magazine housing member 94, there is provided an upstanding lug 94a which is connected to the handle portion 36 of the tool body by means of a bolt 97 and nut 98. The butt portion 36 is formed with an elongated slot 36a therein to accommodate the bolt 97 and permit the magazine housing member 94 to be moved rearwardly without necessitating the removal of the bolt. The forward end, or feed throat portion of the magazine comprises a forwardly extended tongue portion 94b of parallelogram shape in transverse cross section (FIG. 7) which is adapted to extend into a longitudinal recess or guideway 64c formed on the outside of the fixed wall member 64 on the nosepiece. The tongue portion 94b is thus slidable longitudinally within the guideway 64c and may be removed therefrom by rearward withdrawal of the housing member 94 when the nut 98 is loosened. The housing member 94 is thus firmly supported at its forward end by the wall member 64 and at its rearward end by the lug 94a connected to the handle butt portion 36 of the tool.

The pivotal magazine housing member 95 also includes a forwardly projecting tongue portion 95b opposite the tongue 94b on the housing member 94, and these tongues define the sidewalls of the feed throat for guiding nails into the feedway section 50 from the magazine. The tongue 95b is adapted to seat within a recess 66d formed on the inside surface of the movable gate member 66 adjacent the rearward end so that when the gate member is closed (FIG. 2), the tongue portion 95b of the movable magazine member 95 is firmly held within the recess 66d and is maintained by the gate 66 in a latched or closed position. When the gate member 66 is unlatched and pivoted by a spring 99 (FIG. 14) to the open position shown in dotted lines (FIG. 2), thereby exposing the interior of the feedway 50, the movable magazine member 95 may then be swung open to the position shown in dotted lines, so that a new bundle of fasteners may be inserted into the fixed member 94 of the magazine. After insertion of a bundle of nails into the magazine the forward or leading end portion of the coiled carrier strip is detached from the coil and threaded forwardly from the magazine along the groove 64a in the wall member 64 until the leading fastener in the strip is centered in coaxial alignment in the drive track 44. Because the entire feed path from the magazine to the drive track is open and exposed, this initial threading can be accomplished rapidly. When the gate 66 is then closed after first closing the magazine member 95, the plunger head 71a engages the shanks of the number 2 and number 3 nails in the carrier strip, accurately centering the leading nail in the drive track and holding the carrier strip of nails firmly in groove 64a ready for operation. It should be noted that the tongue portions 94b and 95b of the housing members diverge outwardly from one another in a rearward direction to facilitate smooth and easy feeding of the strip as it is uncoiled and moves into the feedway defined by the facing inside surfaces of the wall 64 and gate member 66. Moreover, the curved rear end portion of the rib 64b on the lower surface of the nosepiece flange 58 smooths the transition or entry of the nails on the strip from the throat portion of the magazine into the feedway, and because the carrier strip is of flexible material the angular displacement between the nails held in the magazine assembly and the nails in the feedway is not of consequence and causes no problems in feeding.

The removable gate member 66 is normally biased toward the open position (FIG. 2 in phantom) by means of a coiled bias spring 99 disposed on the pivot pin 67 between the spaced apart, forwardly projecting lug portions 66a, as best shown in FIG. 14. As therein shown, one leg of the spring 99 extends into a slot formed in the body of the gate member while the other leg bears against an adjacent side surface in the recess 60a of the body portion of the nosepiece adjacent the drive track 44. Accordingly, when the gate member is released or unlatched from the closed position, the spring 99 pivots the gate outwardly in a clockwise direction to the open position, exposing the interior wall 64 of the feedway. When the gate 66 is closed, the forward tongue 95b of the magazine housing member 95 is held or latched in place by the rear end portion of the gate, and the gate 66 then defines a guiding sidewall for the nails in the feedway section 50 parallel to the fixed sidewall 64. From the foregoing it can be seen that the entire magazine assembly 38 can be readily detached from the tool by simply removing the bolt 97 and withdrawing both of the housing members 94 and 95 rearwardly therefrom. Preferably, the spacing or distance between the upper and lower internal wall surfaces of the magazine housing members 94 and 95 is dimensioned appropriately to accommodate nails of the largest type that are to be handled and driven by the tool. When a bundle or coil of nails is loaded into the magazine, the pointed lower ends of the nail shanks are supported and rest on the lower wall surfaces of housing members, and the heads of the nails are spaced below the upper wall surfaces of the housing members. As best shown in FIG. 21, the web of the carrier strip 33 is extended across the upper portion of the nail shanks just below the heads and is substantially smaller in vertical dimension than the length of the nail shank from head to point

so that the lower end portions of the nail shanks extend some distance below the lower row of hinge tabs of the carrier strip. Accordingly, a carrier strip of given dimensions can be used for holding nails of various different lengths and sizes, and because the carrier strip is flexible, feeding of the nails from the forward throat portion of the magazine 38 into the guideway 50 is smooth and easy. Moreover, because the bottom of the guideway 50 is open and because the carrier strip 33, rather than the nails themselves are supportingly engaged with the guiding wall surfaces of the guideway, different sizes of nails can be accommodated in the guideway without requiring adjustments or changes therein or changes in the magazine assembly 38. In a tool embodying the present invention, nails ranging in length from $1\frac{1}{4}$ to $1\frac{1}{2}$ inches were handled and driven successfully without any changes or adjustments in the magazine or guideway structure of the tool being required. This feature of the tool is extremely useful in operations wherein different sizes of nails are required and changes in type and size of nails used are relatively frequent during the operation. Moreover, in special applications, a single carrier strip 33 may be loaded with several different sizes of nails in the desired sequence if desired.

In accordance with the present invention, the movable gate member 66 and the pivoting housing member 95 of the magazine assembly are held and latched in the closed position by a single latch member 100 (FIGS. 7 and 15) which is pivotally mounted on the rear edge of the flange 58 on a washer 101 supported on a cap screw 102. The latch member includes a handle or tab portion 100a at the outer end which is manually grasped for lifting the latch out of its normal or latching position to a released position, wherein the gate 66 and forward tongue portion 95b of the magazine housing member 95 can be opened. The latch member includes a downwardly extending latching dog 100b having an inwardly and downwardly sloping inside edge surface adapted to engage an indentation or recess 66e formed on the outer surface of the gate member 66 adjacent the rearward upper corner thereof, as best shown in FIGS. 1, 7, and 17. When the latch member is in its normal or latched position, as shown in FIG. 7, the inside sloping edge of the dog portion 100b is engaged against the indentation 66e on the gate member 66 and holds the gate and forward tongue portion 95b of the magazine housing member in a closed position.

When the latch is released by grasping the tab portion 100a and pivoting the latch member upwardly in a clockwise direction (as viewed in FIG. 7), the dog 100b moves out of engagement with the wall member 66 and it springs open under the influence of the biasing spring 99, as previously described. After the fasteners have been loaded into the magazine assembly and threaded into the guideway, as previously described, the magazine member 95 is closed, the gate member 66 is closed, and the latch member is released downwardly to latch these members in the closed position so that the tool is ready for firing. The opposite end of the latch member 100 is provided with an intumed tab portion 100c having a small hole therein in which is seated the upper end or stem portion of a short headed pin member 103. The pin 103 is provided with a frustoconical surface adjacent its lower end which is adapted to seat against a frustoconical surface formed at the upper end of the internal bore of a hollow depending spring guide member 104, as best shown in FIG. 6.

The spring guide member 104 includes an outwardly extended annular ring 104a at the upper end and a coiled biasing spring 105 is coaxially seated on the hollow 104 with the upper end of the spring bearing against the lower surface of the ring 104a. The spring 105 biases the tab portion 100c of the latch member 100 upwardly or in a counterclockwise direction, as viewed in FIG. 7, and normally maintains the latch member 100 in a latched position.

The lower end portion of the hollow spring guide member 104 projects downwardly through an opening formed in a short horizontal bracket 106a formed on the leg of a safety valve presser foot assembly 106 intermediate its ends. The

lower end of the spring 105 biases the presser foot assembly downwardly toward a safe position so that the tool may not be fired unless the lower end of the drive track is pressed into contact against a workpiece. For this purpose, the presser foot assembly includes a lower collar portion 106b which is disposed for vertical sliding movement on a cylindrical, lower end portion 60b of the nosepiece body defining the lower end portion of the drive track 44 (see FIGS. 8, 9, and 10). As best shown in FIG. 16, the upper end of the cylindrical portion 60b terminates at a horizontal shoulder surface 60c, and the collar 106b is slidable between a lower or extended position below the lower end of the drive track and an upper or fire position (not shown) wherein the upper edge of the collar engages the surface 60c. The presser foot assembly 106 includes a body portion extending upwardly, laterally outwardly and rearwardly of the collar 106b; and the bracket 106d which engages the lower end of the spring 105 is integrally formed on the body intermediate its upper and lower ends. A vertically extending leg portion 106c extends upwardly of the bracket 106a and is slidable within a rearwardly facing slot or groove 58c (FIG. 15) formed in the flange 58 of the nosepiece. The collar 106b is guided for vertical sliding movement on the lower nosepiece segment 60b and the upper end portion of the vertical leg 106c is slidable and guided within the slot 58c in the nosepiece flange. The presser foot assembly 106 is formed with a bifurcated flange 106d at its upper end which is in slidable engagement on the operator stem 57 of the valve mechanism 56 between the lower end flange 57a and an upper flange portion 57b spaced therefrom. Thus, when the lower end of the nosepiece 60b is engaged against a workpiece the collar 106b is moved upwardly, causing the bifurcated flange 106d to move the stem 57 upwardly to the fire position. The spring 105, which biases the latch member 100 to the latched position, serves an additional purpose in returning the presser foot collar 106b downwardly to the extended or safe position when the tool is lifted from a workpiece.

In order to support the carrier strip 33 forwardly of the drive track 44, especially when there are only one or two nails remaining in the strip and in order to prevent the forward side of the plunger head 71a from biasing the strip too far forwardly in the drive track when the last nail remaining on the strip is on the forward side thereof, the tool is provided with the strip support assembly 54 which is in communication with the drive track directly opposite the forward end of the feedway 50. The strip support assembly includes a U-shaped bracket 108 having a pair of spaced, vertical legs 108a and 108b joined at their lower ends by a bight portion 108c. A flange 108d is provided at the upper end of the leg 108a and this flange is secured to the underside of the nosepiece upper flange 58 by a plurality of cap screws 109 (FIG. 1). In order to accurately align the bracket 108 with the forward or exit opening 44a (FIGS. 23 and 24) of the drive track, a small downwardly extending tab portion 108e is integrally formed at the rear end of the bight portion 108c, and the tab is seated in a recess 60d (FIGS. 16 and 21) formed on the forward face of the body 60 of the nosepiece below the drive track exit opening 44a.

In order to guide and support the portion of the carrier strip 33 forwardly and outwardly of the drive track a camming block 110 is attached by drive screws 111 to the downwardly depending leg 108a of the U-shaped bracket and, as shown in FIGS. 2, 4, 20, and 21, the camming block includes a tapered rearward end portion (FIG. 15) which projects into the exit opening 44a and terminates just forwardly of the drive track 44. Referring to FIGS. 20 and 24, the camming block includes an outer face 110a in closely facing parallel relation with the inside surface of the opposite support leg 108b and the web of the strip moves outwardly from the drive track between the surface 110a and the leg 108a. The rearward end portion of the surface 110a is tapered inwardly toward the center of the drive track as at 110b to help guide the web of the carrier outwardly against the inside surface of the leg 108b, which is aligned with the lateral or side surface of the groove 64a in the fixed wall portion 64 of the feedway.

As best shown in FIG. 21, the camming block is formed with a downwardly and rearwardly sloped upper surface 110c intermediate its end, and the rearward end portion of the block is formed with a more steeply sloped surface 110d which engages the upper hinge tabs on the carrier strip and causes the tabs to be deflected upwardly from the position of FIG. 23 as the nails are driven toward the normal position, as shown in FIG. 24, when the strip moves forwardly away from the drive track of the tool. The surface 110f of the camming block extends downwardly below the web portion of the carrier strip and, accordingly, the lower hinge tabs are maintained in a downwardly deflected position (FIGS. 23 and 24) until they move forward of the camming block and begin to return to the normal position.

As best shown in FIG. 24, the lower hinge tabs of the carrier strip forward of the drive track tend to deflect upwardly or return to their original position immediately after each nail is driven but are prevented from doing so by the surface 110a; however, the action of the lower hinge tabs in tending to return to the normal channel-shaped configuration forces the web of the strip against the inside surface of the leg 108b and thus the strip is supported between the bracket leg 108b and the surface 110a by its own action, even though the clearance between these two surfaces is greater than the thickness of the web. Accordingly, the carrier is amply supported between the leg and camming block yet is free to move longitudinally forwardly and out of the strip support assembly 54 with little resistance. In this connection it should be noted that the forward edges of the bracket leg 108b and camming block 110 are spaced forwardly of the drive track a precise distance to lie on a plane intersecting the upper and lower apexes of the diamond shaped openings in the carrier web each time the carrier is advanced to a position wherein a nail is centered in the drive track. The portion of the carrier strip protruding forwardly of the forward edges of the camming block and leg 108b can be easily severed by tearing off against one or the other of these edges from time to time as the tool is used.

From the foregoing, it should be noted that the carrier strip 33 is supported both forwardly and rearwardly of the drive track 44 by the strip support assembly 54 and the groove 64a in the feedway 50. Each nail 32 positioned in the drive track is supported by the carrier before and during a power stroke of the driver. When the first and second nails in a new carrier strip are being driven, the strip is supported by the groove 64a, and when the last and next to the last nails are driven, the strip is supported by the strip support assembly 54. When nails intermediate the ends of the strip are being driven, the strip is supported on both sides of the drive track. Because of these support arrangements, it is unlikely that the carrier will become misaligned in the tool; hence, all of the nails in a strip can be driven with little chance of trouble. In addition, the forward support assembly 54 facilitates severance of the carrier strip forwardly of the tool by concentrating the tearing forces at a weakest portion of the strip aligned with the upper and lower apexes of a diamond-shaped opening therein.

Although the present invention has been described with reference to several illustrative embodiments thereof, it should be understood that numerous other modifications and embodiments can be devised by those skilled in the art that will fall within the spirit and scope of the principles of this invention.

We claim:

1. A tool for driving fasteners mounted on an elongated flexible carrier strip comprising a drive track, a driver movable in said drive track, guide means for directing fasteners on said carrier strip into said drive track, feed piston means movable toward and away from said drive track and pawl means on said piston means projecting laterally into said guide means and engageable with said carrier strip on forward movement to advance fasteners toward said drive track, said pawl means including a cam surface engageable with said carrier strip on rearward movement for deflecting said carrier strip laterally in said guide means without rearward travel thereof.

2. The tool of claim 1 wherein said pawl means includes an end portion engageable with said carrier and extending a fixed distance laterally into said guide means from one side thereof, said end portion having an end surface movable along a plane parallel with the longitudinal axis of said guide means.

3. The tool of claim 1 wherein the end portion of said pawl means includes an advancing face normal to the longitudinal axis of said guide means for advancing said carrier strip toward said guideway, said cam surface sloped rearwardly and laterally outward of the longitudinal axis of said guide means.

4. The tool of claim 1 including detent means for normally preventing rearward movement of said strip in said guideway during rearward travel of said pawl means therein.

5. The tool of claim 4 wherein said detent pawl means engages said fasteners on said strip and biases said strip laterally toward said pawl means.

6. The tool of claim 1 wherein said carrier strip includes longitudinally spaced openings therein, said pawl means projecting into said openings for advancement of said strip on forward movement of said piston.

7. The tool of claim 6 wherein said pawl means includes a forward face transversely of said strip engageable with the forward edge of said openings therein on forward movements of said piston means, said cam surface engageable with the rearward edges of said openings on rearward travel for deflecting said strip laterally of said guideway.

8. A tool for driving fasteners mounted on an elongated flexible carrier strip comprising a drive track, a feedway for directing fasteners on said strip into said drive track, said feedway including a fixed wall and an opposite wall movable between a closed position and an open position exposing the interior of said feedway, a magazine in communication with said feedway for holding a supply of fasteners on said carrier strip, said magazine including a wall movable between a closed position and an open position exposing the interior of said magazine and releasable latch means pivotally mounted remotely of said movable walls of said magazine and said feedway and engageable with one of said walls for holding both said walls in said closed position.

9. The tool of claim 8 wherein said movable walls of said feedway and said magazine are engageable with each other in said closed position and disengaged from one another when one of said walls is in an open position.

10. The tool of claim 8 including means for biasing said movable wall of said feedway toward said open position.

11. The tool of claim 8 including a feeder piston movable toward and away from said drive track, feed pawl means mounted on said piston and projecting laterally inwardly into said feedway through said fixed wall for advancing said strip forwardly on forward strokes of said piston, and detent pawl means mounted on said movable wall of said feedway for restraining rearward movement of said fasteners in said feedway during rearward movements of said feed pawl means.

12. The tool of claim 11 wherein said detent pawl means is engageable between a pair of fasteners in said feedway rearward of said guideway and biases said carrier strip toward said feed pawl.

13. The tool of claim 9 wherein the forward end portion of said magazine is pivotally movable about an axis rearwardly remote therefrom and is engageable with the rearward end of said feedway movable wall when in a closed position.

14. A tool for driving fasteners mounted on an elongated carrier strip having a web portion transversely of said fasteners and laterally offset therefrom, said tool comprising a longitudinal drive track, a driver slidable therein, guide means in communication with said drive track and extending transversely rearward thereof for directing fasteners on said carrier strip into said drive track, and strip support means extending transversely forward of and laterally offset from said drive track in communication therewith opposite said guide means for supporting and directing said web portion of said strip away from said drive track after fasteners have been driven by said driver.

15. The tool of claim 14 wherein said carrier strip includes a perforated web portion and said strip support means includes opposite sidewalls facing adjacent opposite sides of said strip, said sidewalls having forward edges extending transversely of said strip and spaced forwardly of said drive track so as to lie adjacent a perforation in said strip when said strip is longitudinally positioned in said feedway to align a fastener in said drive track, thereby facilitating the severance of said strip at said perforation.

16. The tool of claim 15 wherein said strip is normally channel shaped in cross section and includes hinge tabs spaced along upper and lower longitudinal edges of said web portion for supporting said fasteners, said sidewalls of said support means extending below the lower edge of said web portion of said strip for maintaining said lower hinge tabs in a downwardly deflected condition until forward of said strip support means.

17. The tool of claim 16 wherein said strip support means includes a spaced apart upper guide surface for deflecting the upper hinge tabs on said carrier from a downwardly deflected position substantially normal to said web portion.

18. A tool for driving fasteners mounted on a carrier strip constructed of flexible material and comprising an elongated web laterally offset along one side of said fasteners and including pairs of hinge tabs along opposite upper and lower edges of said web for holding said fasteners transverse thereto, said tool comprising a drive track parallel to said fasteners, a driver slidable in said track, an elongated feedway extending laterally rearward of said drive track for directing said strip and fasteners to position successive fasteners in axial alignment in said drive track, a feed pawl extending laterally into said guideway from one side thereof and movable toward and away from said drive track along a line inwardly and parallel of said one side, said feed pawl including a rearwardly and outwardly sloping cam surface for deflecting said web portion laterally inwardly away from said one side on rearward travel thereof.

19. The tool of claim 18 including detent pawl means extending laterally inwardly into said feedway for preventing rearward travel of said strip as said feed pawl moves rearwardly therein.

20. The tool of claim 19 wherein said feedway includes a pivotal opposite wall movable from a closed position parallel to said one side to an open position exposing the interior of said feedway, said detent pawl means being mounted on said opposite wall and engageable with said fasteners when said wall is in a closed position.

21. A fastener driving tool of the type having a pressurized fluid actuated driver for driving successive fasteners from an elongated carrier strip having weakened portions spaced a given distance from each other, said tool comprising a drive track defining structure for slidably receiving the driver and having two generally opposite openings communicating with the drive track, a first guideway structure connected to the drive track structure and communicating with a first one of the openings, fastener feeding means for feeding the fastener strip over the first guideway structure into the drive track to permit the fasteners on the strip to be driven in sequence by the driver, and a second guideway structure connected to the drive track structure and communicating with the drive track through the second of the openings to receive the strip from which the fasteners have been driven by the driver, said second guideway structure having an edge surface for use in tearing the strip along one of said weakened portions, said edge surface being spaced from the drive track a whole number multiple of said given distance.

22. The tool of claim 21 wherein said second guideway structure includes a pair of spaced apart wall portions disposed on opposite sides of said strip, each of said wall portions having an edge surface spaced from said drive track a whole number multiple of said given distance.

22. The tool of claim 21 wherein said second guideway structure includes a pair of spaced apart wall portions disposed on opposite sides of said strip, each of said wall por-

tions having an edge surface spaced from said drive track a whole number multiple of said given distance.

23. The tool of claim 22 for use with a carrier strip of channel shaped cross section including a web portion having said weakened portions therein and upper and lower rows of movable hinge tabs along opposite longitudinal edges of the web for supporting said fasteners, said spaced wall portions guiding said web portion disposed therebetween and having portions extending beyond one longitudinal edge thereof for preventing return of the hinge tabs to a position substantially normal to said web until said tabs are forward of said edge surfaces, thereby preventing movement of said strip rearwardly toward said first guiding structure.

24. The tool of claim 23 wherein one of said wall portions includes a longitudinal upper edge surface for supporting the hinge tabs on said strip along the other edge of said web.

25. A fastener driving tool for use with a fastener strip including a plurality of spaced fasteners joined by a connecting means, which tool comprises a housing including a first structure defining a cylinder and a drive track, first piston means slidably mounted in the first cylinder and including a fastener driver slidably mounted in the drive track, said first cylinder being selectively supplied with pressurized fluid for moving the piston means between opposite ends of the first cylinder to actuate the fastener driver; one end of the first cylinder adjacent the drive track being connected to the atmosphere, a magazine assembly on the housing and adapted to receive a fastener strip, said assembly including an opening through which the fastener strip can be withdrawn and said housing including an opening into said drive track, structure connecting said openings for feeding a fastener strip from the magazine assembly into the drive track, a fastener strip feeding mechanism including a strip engaging element and a second piston means slidable in a second cylinder and coupled to the strip engaging element, and pneumatic means for controlling the operation of said second piston means and including a passageway between the first and second cylinders, said passageway including a port opening into said first cylinder and alternately connected to the pressurized fluid in the first cylinder and to the atmosphere through said one end of the cylinder by movement of the first piston means relative to the port as the first piston means moves between the opposite ends of the first cylinder.

26. The tool of claim 25 wherein said strip engaging element is slidable between opposite ends of longitudinal slot means formed in said second cylinder, thereby limiting the travel of said second piston means in said second cylinder.

27. The tool of claim 26 wherein said slot means is in communication with said structure for connecting said openings.

28. The tool of claim 25 including spring means for biasing said second piston means toward one end of said second cylinder.

29. The tool of claim 25 wherein one end of said second cylinder is connected to said passageway and the other end is vented to the atmosphere.

30. The tool of claim 25 wherein said first piston means includes a piston head adjacent said one end of said first cylinder and a stem of reduced diameter extending opposite said one end defining an annular piston chamber around said stem movable into and out of communication with said port.

31. A fastener driving tool including a body having a hollow cylinder open at one end, a piston slidable in said cylinder toward and away from said one end, a nosepiece secured to said body adjacent said one end defining a drive track parallel of said cylinder and a driver secured to said piston and slidably disposed in said drive track, said nosepiece including an upper flange extended radially of said drive track and formed with spaced apart lugs projecting upwardly thereof secured against said one end of said cylinder defining at least one radial exhaust port between said lugs for venting said one end of said cylinder to the atmosphere.

32. The driving tool of claim 31 including an annular bumper means of resilient material mounted on said flange

projecting into said cylinder for cushioning a power stroke of said piston moving toward said one end, said bumper including at least one longitudinal groove formed on the exterior surface thereof in communication between the interior of said cylinder and said exhaust port.

33. The driving tool of claim 32 including ring means around said drive track projecting upwardly of said flange into said bumper for preventing inward compression of said bumper against said driver when compressed by said piston.

34. In combination with an elongated flexible carrier strip extended transversely of the elongated shanks of a plurality of fasteners supported thereby adjacent one end of said shanks, a fastener driving tool comprising a drive track, a driver slidable in said track, guide means in communication with said track for supporting said strip independent of the opposite ends of said fasteners and guiding the fasteners on said strip into said track, and magazine means in communication with said guide means for holding a supply of fasteners in a bundle with said strip in coiled configuration, said magazine means including fixed support wall means engageable with the other end of said fasteners remote from said strip for supporting said bundle, whereby fasteners of different length may be fed from said magazine means into said guide means without adjustment of said wall means therefor.

35. The combination of claim 34 wherein said guide means includes a sidewall having groove means therein for supporting said carrier strip during movement toward said drive track,

said support wall means being disposed on a plane angularly disposed with respect to groove means.

36. A fastener driving tool comprising a drive track, a driver slidable in said track for driving fasteners, a power cylinder, a power piston slidable between opposite ends of said power cylinder for moving said driver on successive power and return strokes, a feed cylinder, a feeder piston slidable between opposite ends of said feed cylinder for moving successive fasteners toward said drive track to be driven, and passage means in communication between said feed cylinder and port means defined in the wall of said power cylinder intermediate said ends thereof for supplying pressurized fluid to move said feeder piston on a stroke upon movement of said power piston past said port means on a stroke.

37. The fastener driving tool of claim 36 wherein said feeder piston is moved on a stroke away from said drive track as said power piston passes said port means on a power stroke.

38. The fastener driving tool of claim 36 including vent means for venting one end of said power cylinder to the atmosphere, said feed cylinder having one end vented to the atmosphere through said passage means, said port means, said power cylinder, and said vent means when said power piston is on one side of said port means and said one end of said feed cylinder in communication with compressed fluid in said power cylinder when said power piston is on the other side of said port means.

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