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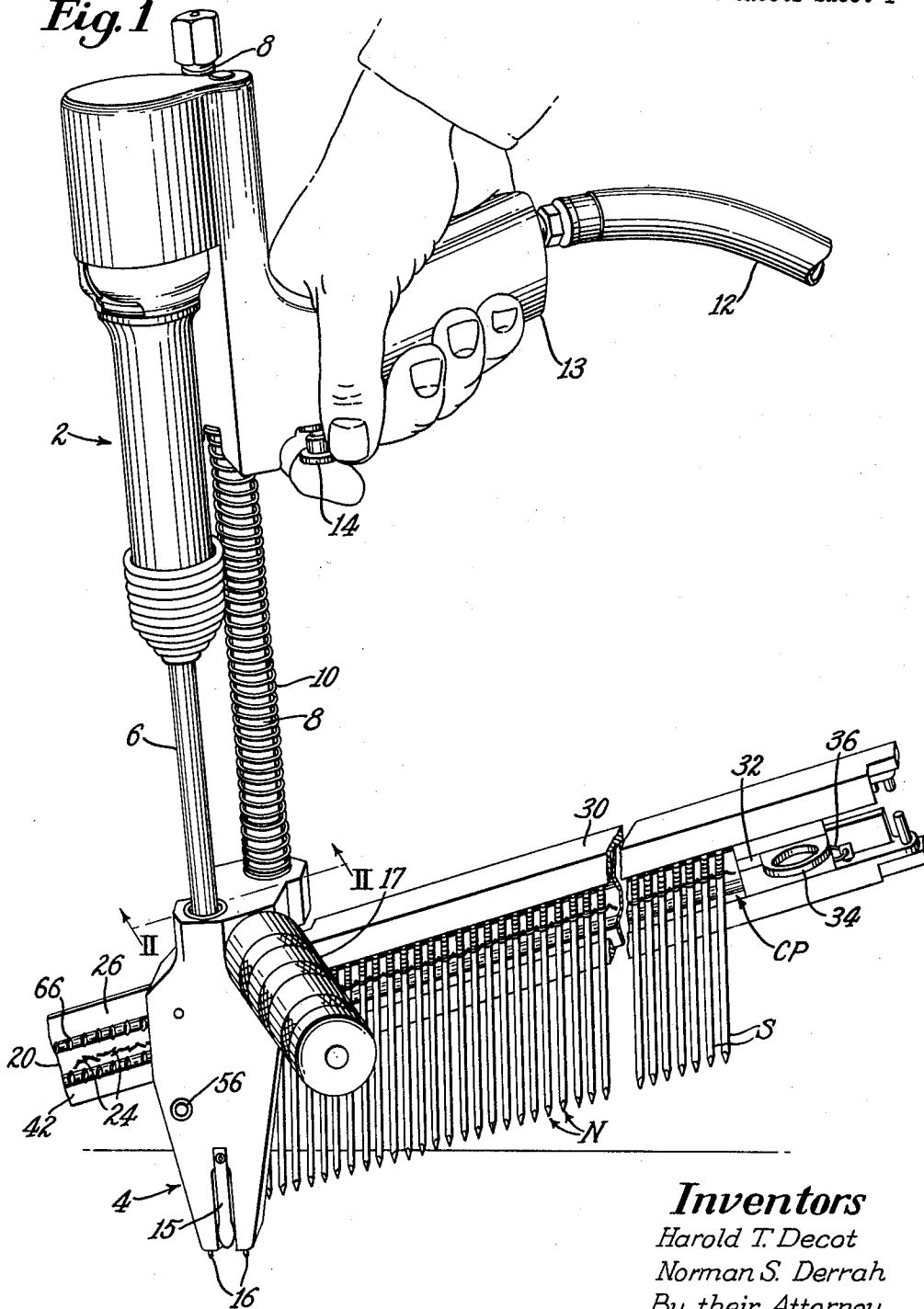
H. T. DECOT ETAL
FASTENER INSERTING TOOLS

3,157,884

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2 Sheets-Sheet 1

Fig. 1



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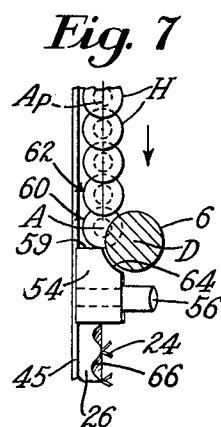
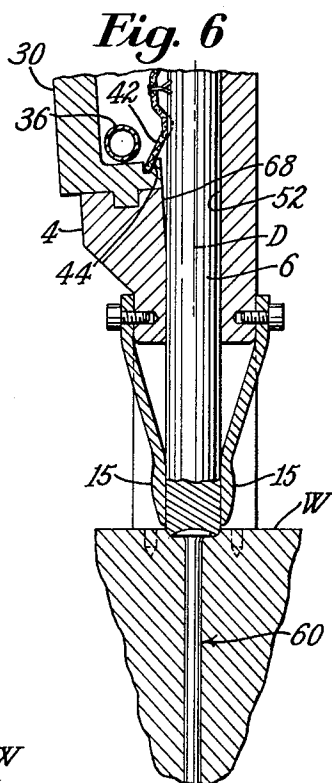
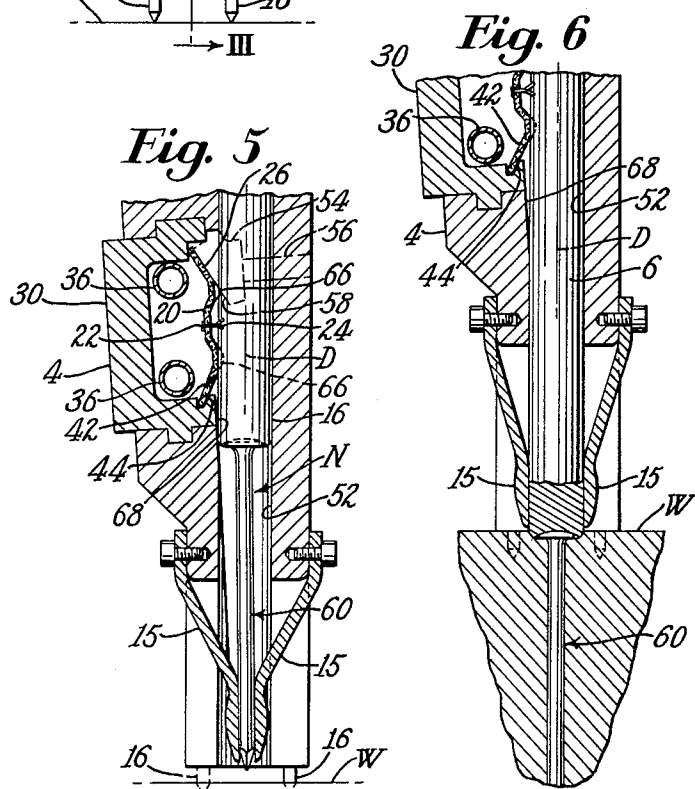
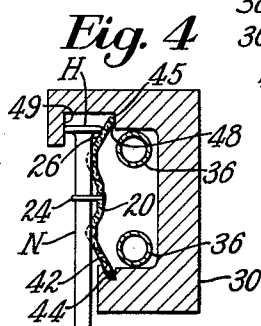
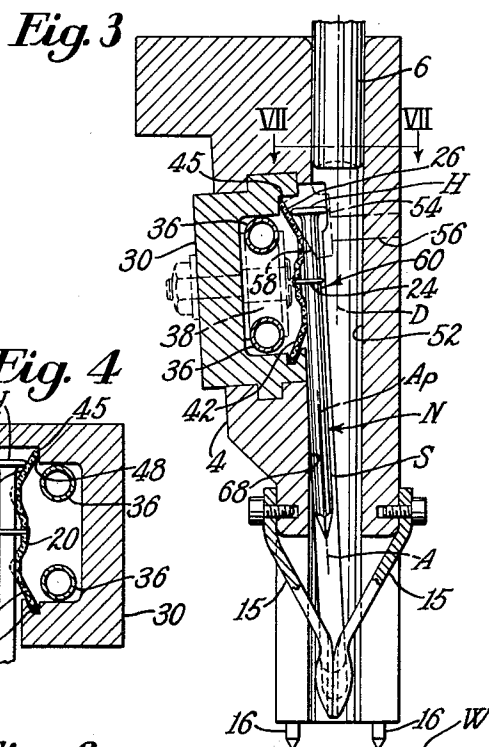
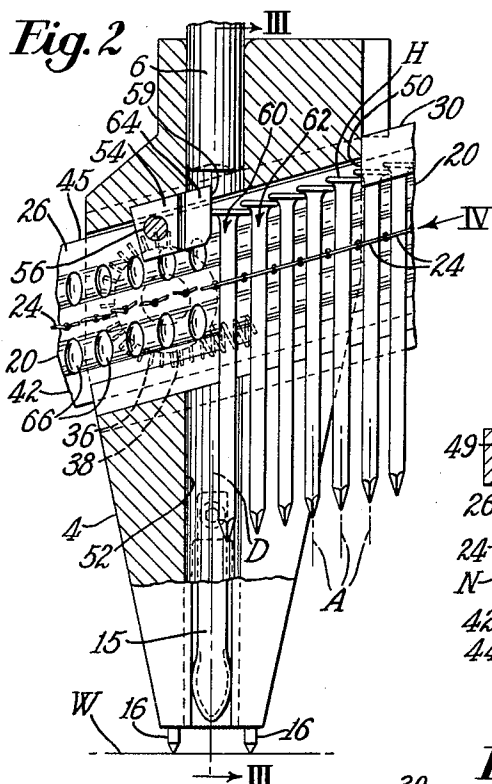
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2 Sheets-Sheet 2



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3,157,884

FASTENER INSERTING TOOLS

Harold T. Decot, Wenham, and Norman S. Derrah, Lynn, Mass., assignors to United Shoe Machinery Corporation, Boston, Mass., a corporation of New Jersey
Filed Dec. 10, 1962, Ser. No. 243,343
11 Claims. (Cl. 1—53)

This invention relates to fastener inserting and more particularly to portable fastener driving tools which are adapted to drive one fastener at a time from a package containing a plurality of fasteners closely assembled and uniformly oriented with respect to their ends.

Numerous portable hand tools or fastener guns are in use today and for many of them there have been developed special packs of preassembled fasteners. The majority of packages which were designed for use with a particular driving tool are made with the primary object of assembling the greatest number of fasteners in the smallest length package. Generally this is accomplished by first producing so-called specialty fasteners, i.e. those generally not available in bulk and comprising a particular flat or easily nested configuration. These specialty fasteners, while they lend themselves to efficient packaging are extremely costly to make when compared with the readily available bulk type fastener. Recognizing this limitation, we have developed a package containing bulk type fasteners which are assembled with the maximum special efficiency. Our new package or cartridge pack as it is also called, is disclosed in our copending application for United States Letters Patent Serial No. 231,223, filed October 17, 1962.

The application teaches how headed fasteners of the types readily available in bulk, such as common, sinker and threaded shank nails, etc., may be oriented with respect to their ends and releasably secured by frangible means to the surface of a carrier strip. The heads of the fasteners are in shingled relationship and their shanks lie in substantial parallelism in a common plane. The strip is constructed and the fasteners positioned thereon so that movement of fasteners lengthwise of their axes will cause their heads to engage a camming surface on the strip to impart a lateral movement to the fasteners and apply tension to the frangible means securing them to the strip. One fastener at a time is thus released from the strip without disturbing the remaining fasteners.

It is an object of this invention to provide a simple tool for driving fasteners from our new package or cartridge pack.

It is another object of this invention to provide a fastener inserting tool which, by a single stroke of a fastener driver, will remove one fastener from the cartridge pack, orient it with respect to the work, and fully drive it thereinto without touching or otherwise disturbing the remaining fasteners in the package.

It is still another object of this invention to provide a driving tool which is capable of driving prepackaged fasteners of the bulk type which may be operated in any angular position.

It is another object of this invention to provide a driving tool for handling fasteners packaged in the above described manner which is economical to manufacture and which may be operated with a minimum amount of skill on the part of an operator.

In accordance with these objects and as a feature of this invention there is provided in a driving tool for inserting fasteners having heads and shanks, raceway means for guiding fasteners uniformly oriented with respect to their ends and with their shanks in a common plane to a driver which is movable along a predetermined path adjacent the raceway guiding means. Stop means located in the fastener plane positions one fastener at a time in the

path of a driver. The driver is located laterally adjacent and offset from the raceway and is angularly oriented relatively thereto so that it intersects the fastener plane at an acute angle measured in the direction of movement of the driver to engage only a lateral portion of the head of each fastener. The raceway, driver and the fastener stop are located with respect to each other and cooperate so that the axis of the driver is offset in two directions from the axis or particularly the center of the head of the fastener being driven, one being lengthwise of the plane which the assembled fasteners occupy and the other being disposed laterally of said plane.

The above and other features of the invention including various novel details of construction and combinations of parts will now be more particularly described with reference to the accompanying drawings and pointed out in the claims. It will be understood that the particular tool embodying the invention is shown by way of illustration only and not as a limitation of the invention. The principles and features of this invention may be employed in varied and numerous embodiments without departing from the scope of the invention.

In the drawings,

FIG. 1 is a perspective view of a portable fastener inserting tool embodying the invention;

FIG. 2 is a sectional view taken along the line II—II on FIG. 1;

FIG. 3 is a sectional view taken along the line III—III on FIG. 2;

FIG. 4 is a sectional view taken in the direction of the arrow IV on FIG. 2;

FIGS. 5 and 6 are sectional views similar to FIG. 3 showing, in progression, a fastener being driven by the tool; and

FIG. 7 is a sectional view taken along the line VII—VII on FIG. 3.

The invention is illustrated as embodied in a multiple blow fastener driving tool seen in operative position in FIG. 1. The driving mechanism of this tool is similar to that disclosed in United States Letters Patent No. 2,879,509, issued March 31, 1959, to Congdon et al., to which reference may be had for a more detailed description. It will be appreciated, however, that the invention may be embodied in numerous types and forms of tools of both single or multiple blow operation and that the Congdon type tool is shown for illustrative purposes only.

Referring to FIG. 1, the tool includes a main body portion generally indicated 2 and a nosepiece portion 4. A driver 6 extends from the body 2 into the nosepiece 4. The nosepiece and main body are movable relatively toward and away from each other on a rod 8 fixed to the nosepiece 4 and slidably received in a boss on the unseen side of the body portion of the tool. A coil spring 10 surrounding the rod normally urges the nosepiece 4 and body 2 away from each other. Compressed air is admitted to the body 2 of the tool through a flexible tube 12 attached to its handle 13. Upon depression of a trigger 14 a series of short, sharp blows are imparted to the driver 6 by a conventional air motor (not shown) within the body portion 2 of the tool.

As a nail or other fastener is being driven into a work piece from the nosepiece 4, the driver 6 is gradually moved by the operator into the nosepiece and through jaws 15 at its lower end with the body portion 2 of the tool moving toward the nosepiece 4 which engages the work. Spurs 16 extend from the nosepiece 4 to assist the operator in maintaining the nosepiece in firm engagement with the work. During this process the spring 10 is being compressed and upon release of the tool from the work at the completion of the driving stroke the spring 10 urges the body portion 2 and nosepiece 4 apart. This tool may be provided with an auxiliary

handle 17 secured to the nosepiece to assist an operator in positioning the tool with respect to the work. Whereas the tool is shown driving a nail downwardly it will be understood that it may be operated in any angular position, i.e., upwardly or horizontally etc. As thus described the operation of the tool is similar to that disclosed in the Congdon et al. patent.

The nosepiece portion 4 of the tool is adapted to receive fasteners packaged in the manner taught in our above-identified application. As seen in FIGS. 1 and 3, fasteners, herein illustrated as nails N having shanks S and heads H, are sewn or otherwise releasably secured to a strip 20 of fibrous material with their shanks S parallel and their heads H in touching overlapped relationship. They are herein shown as secured by a line 22 of individual stitches 24, each stitch 24 holding a separate nail. The strip 20 includes a sloping camming surface 26 with which the head H of each fastener is engageable. The package of fasteners as thus assembled in the manner taught in our application is also referred to hereinafter as a cartridge pack CP.

As further taught in our application, when the head H of a nail is urged downwardly with respect to the camming surface 26, it is cammed by the surface to the right as seen in FIG. 3, applying tension to the stitch 24 until it ruptures releasing the nail from the strip 20 so that it may proceed through the jaws 15 and into the work.

Extending upwardly and rearwardly from the nosepiece 4 or to the right as seen in FIG. 1, is a fastener guiding raceway 30 into which a cartridge pack CP of nails has been loaded. The right-hand or trailing end of the cartridge pack CP is engaged by a movable follower 32 having a finger gripping loop 34 fixed to it. The follower 32 is urged toward the nosepiece 4 by a flexible coil spring 36 secured to it and passing around a pulley 38 (FIGS. 2 and 3) located at the lower or left-hand end of the raceway 30. The opposite end of the flexible coil spring 36 is anchored to a rearward inner portion of the raceway at a point not visible in the drawings. To load the tool an operator grips the finger loop 34, withdraws the follower and inserts a cartridge pack CP in the raceway 30. He then replaces the follower 32 to urge the pack downwardly of the raceway 30 toward the nosepiece 4.

The cartridge pack CP herein shown is one of a number illustrated in our above-identified application and has a lower leg or angled portion 42 corresponding in general to the upper leg which has the camming surface 26 formed on it. The cartridge pack CP is received within the raceway 30 with the edge of the lower angled portion 42 in a guideway 44 (FIG. 4). The upper edge 45, i.e., that bounding the camming surface 26, engages a surface 48 on the raceway. A parallel surface 49 engages and guides the nail heads H. The guiding surface 49 terminates at a point 50 (FIG. 2) where the raceway 30 enters the nosepiece 4.

The nosepiece 4 includes a transverse bore or driver passageway 52 into which the driver 6 extends, the axis of the bore and correspondingly that of the driver being indicated by the axis line D. As seen in FIGS. 3 and 5, the raceway also passes into the nosepiece 4 in close proximity to the driver passageway 52 but is oriented at an acute angle with the axis D measured in the direction of driver movement.

At the upper intersection of the raceway 30 is a nail stop or abutment 54 which is secured by a pin 56 fitted within the nosepiece 4. The nail stop 54 has on its lower left side, as viewed in FIG. 3, a sloping surface 58 which is engageable with the camming surface 26 of the cartridge pack CP. Thus the cartridge pack CP is guided on its top edge 45 by the guide surface 48 and the guide surface 49, which as stated above, engages the nail heads H and terminates at the point 50. Thereafter, since the nails N are no longer present when the strip 20 passes

under the nail stop 54 the surface 26 of the pack is guided by the surface 58.

The front or right-hand edge 59 of the stop 54 is the nail engaging surface which, as seen in FIGS. 2 and 7, contacts the leading edge of the head H of the endmost nail 60 in the cartridge CP. It will be seen in FIG. 7 that the surface 59 extends along a line almost in alignment with the axis D of the driver 6. The stop 54 is also provided with an arcuate surface 64 which is, in effect, a curved partial cutout in the side of the stop to accommodate the driver 6 and permit it to pass the stop without touching it.

As seen in FIGS. 2 and 7, the nail stop 54 is positioned wholly outside of the driver passageway but intersects the plane A_p which is defined by the axes A of the individual nails N. At the beginning of the driving stroke the axis D of the driver is not only spaced slightly from the axis A i.e. center of the head H, of the endmost nail measured in its direction of movement, i.e. downwardly as seen in FIG. 7, but is offset laterally to the right of the axis A, or center of the head H, of the endmost nail and of the plane A_p which includes all of the axes. Thus, the driver 6 strikes about a quarter of the nail head H, engaging it substantially in the lower right-hand quadrant as viewed from above or as in FIG. 7. This assures that: first, the driver 6 can pass safely beyond the head of the next-to-endmost nail 62, and secondly, will not move downwardly against the camming surface 26 of the cartridge pack CP, as the nail head H is cammed against the surface. In actual practice the driver 6 may touch slightly the crest of the strip 20 as it passes through the individual valley 66 in the strip (FIG. 5) in which the nail is originally secured but this engagement is so slight as not to cause misalignment of the fibrous material of the cartridge pack CP or the nails remaining in it.

As stated above, the raceway 30 and hence the plane A_p containing the axes A of the individual nails is cocked or offset at an acute angle with the axis D of the driver measured in the direction of its movement. This assists in maintaining only the desired portion of the nail head H in the path of the movement of the driver and assures that the fibrous nail strip 20 is out of the path of the driver 6. To accommodate the nail in this offset position and to assist it in entering the jaws 15 a camming surface 68 is formed in the nosepiece 4 adjacent the nail passageway 52.

The tool operates as follows: With a cartridge pack CP inserted in the raceway 30 in the manner above described, the endmost nail 60 is located in the tool, as seen in FIGS. 2 and 3, with its head H in engagement with the nail engaging surface 59 of the nail stop 54 and a substantial portion of its shank S lying in the driving chamber 52 either against or close to the surface 68. Upon depression of the trigger 14 of the tool, a series of short, sharp blows is imparted to the driver 6 which under the control of the operator is caused to descend upon the head H of the nail 60. As seen in FIG. 7, the driver will pass the next-to-endmost nail 62 without touching it and drive the endmost nail 60 downwardly. In the manner explained in our above-identified application when the head H is urged downwardly of the camming surface 26 of the strip 20, the nail is cammed to the right as seen in FIG. 3 (the strip being firmly held by the raceway 30 and the surface 58 of the stop 54) until the stitch 24 ruptures whereupon continued downward movement of the driver urges the nail downwardly of the surface 68 and into the jaws 15, as seen in FIG. 5, and ultimately throughout the jaws 15 into the work piece W, as seen in FIG. 6. After engaging the endmost nail 60 the driver 6 is in position to prevent the next-to-endmost nail 62 from entering the driving chamber 52 or engaging the nail stop 54. Upon withdrawal of the driver 6, however, the entire strip is free to move downwardly to the left as seen in FIG. 2 under the force

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of the spring 36 acting upon the follower 32 until the edge of the head H of the nail 62 engages the surface 59 of the nail stop whereupon the cycle may be repeated.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent of the United States is:

1. A tool for inserting fasteners having heads and shanks comprising, in combination, means for guiding fasteners for feeding movement with their heads uniformly oriented and with their shanks in a common plane, a driver movable along a predetermined path adjacent the delivery end of the guiding means and laterally offset from said guiding means in a direction normal to the plane defined by the fastener shanks, and means for locating a portion of one fastener at a time in the path of said driver.

2. A tool for inserting fasteners having heads and shanks comprising, in combination, means for guiding fasteners for feeding movement with their heads uniformly oriented and with their shanks in a common plane, a driver movable along a predetermined path adjacent the delivery end of the guiding means and intersecting the plane defined by the shanks at an acute angle, and means for locating a portion of one fastener at a time in the path of said driver to be driven thereby.

3. A tool for inserting fasteners having heads and shanks comprising, in combination, means for guiding fasteners with their heads uniformly oriented and with their shanks in a common plane, means for moving the fasteners along said guiding means, a driver movable along a predetermined path adjacent the delivery end of said guiding means and laterally offset from said guiding means in a direction normal to the plane defined by said fastener shanks, said driver path intersecting said plane at an acute angle measured from said plane, and means to position one fastener at a time in the path of the driver.

4. A tool for inserting fasteners having heads and shanks comprising, in combination, a raceway for guiding fasteners with their heads uniformly oriented and with the axes of their shanks defining a common plane, a driver movable along a predetermined path laterally offset from the raceway in a direction measured from the plane defined by said shanks, means for moving the fasteners along said raceway toward the driver path, said raceway being angularly disposed with respect to the path of the driver when measured from the plane defined by said shanks to present each fastener to the driver with the axis of its shank at an acute angle to the axis of the driver.

5. A tool for inserting fasteners having heads and shanks comprising, in combination, a raceway for guiding fasteners with their heads uniformly oriented and the axes of their shanks defining a common plane, a driver movable along a predetermined path adjacent the delivery end of the raceway, means for moving the fasteners along said raceway toward the driver path, said raceway being oriented and offset from said driver path in a direction measured from the plane defined by said shanks to position each successive endmost fastener in the path of the driver with the center of the head of the fastener spaced laterally from the axis of the driver path.

6. A tool for inserting fasteners having heads and shanks preassembled in a package with their heads uniformly oriented with the axes of their shanks in a common plane comprising, in combination, a raceway for guiding a package of fasteners, a driver movable along a predetermined path adjacent one end of said raceway, means for moving said package of fasteners along said raceway toward said driver path, said raceway being angularly oriented with respect to the driver as measured from the plane defined by the fastener shanks to present each fastener to the driver with the axis of its shank at an acute angle with the driver measured with respect to said plane, and means engageable with the endmost fastener to locate only a portion thereof in the path of said driver.

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7. A tool for inserting fasteners having heads and shanks preassembled in a package with their heads uniformly oriented and the axes of their shanks in a common plane comprising, in combination, a raceway for guiding a package of fasteners for feeding movement, a driver movable along a predetermined path, means for moving said package of fasteners along said raceway toward said driver path, said raceway being located laterally offset from the driver path in a direction normal to the plane defined by said fastener shanks to position the endmost fastener in the path of the driver with the center of the fastener head spaced laterally from the axis of the driver path with respect to said plane, and means engageable with said endmost fastener to locate only a portion of its head in the driver path and to maintain all other fasteners completely out of said path.

8. A tool for inserting fasteners having heads and shanks preassembled in a package with their heads uniformly oriented and the axes of their shanks in a common plane comprising, in combination, a raceway for guiding a package of fasteners, a driver movable along a predetermined path, means for moving said package of fasteners along said raceway toward said driver path, said raceway being located laterally offset from the driver path in a direction normal to the plane defined by said shanks and a fastener stop adjacent the path of the driver and located in said plane, said stop having a surface engageable with each fastener as it reaches said driver path to maintain only a portion of the fastener in the path of the driver.

9. A tool for inserting fasteners having heads and shanks preassembled in a package with their heads uniformly oriented and the axes of their shanks in a common plane comprising, in combination, a raceway for guiding a package of fasteners, a driver movable along a predetermined path, means for moving said package of fasteners along said raceway toward said driver path, said raceway being located laterally offset from the driver path in a direction normal to the plane defined by said shanks, and a fastener stop adjacent the path of the driver and located in said plane, said stop having a surface engageable with each fastener in the package as it reaches said driver path to maintain only a portion of the fastener in the path of the driver measured in the direction of movement of said guided fasteners along said raceway, and a second surface slidably engageable with the fastener package as a guiding surface cooperating with said guiding raceway.

10. A tool for inserting fasteners having heads and shanks preassembled in a package with their heads uniformly oriented and the axes of their shanks in a common plane comprising, in combination, a raceway for guiding a package of fasteners, a driver movable along a predetermined path, means for moving said package of fasteners along said raceway toward said driver path, said raceway being located laterally offset from the driver path in a direction normal to the plane defined by said shanks, and a fastener stop adjacent the path of the driver and located in said plane, said stop having a surface engageable with said fastener as it reaches said driver path to maintain only a portion of the fastener in the path of the driver measured in the direction of movement of said guided fasteners along said raceway, and a concave surface facing said driver path of sufficient size to accommodate the driver.

11. A tool for inserting fasteners having heads and shanks preassembled in a package with their heads uniformly oriented and the axes of their shanks in a common plane comprising, in combination, a raceway for guiding a package of fasteners, a driver movable along a predetermined path, means for moving said package of fasteners along said raceway toward said driver path, said raceway being located laterally offset from the driver path in a direction normal to the plane defined by said shanks, and a fastener stop adjacent the path of the driver and lo-

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cated in said plane, said stop having a surface engageable with each fastener as it reaches said driver path to maintain only a portion of the fastener in the path of the driver measured in the direction of movement of said guided fasteners along said raceway, a second surface slidably engageable with the fastener package as a guiding surface cooperating with said guiding raceway, and a

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concave surface facing said driver path of sufficient size to accommodate the driver.

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