Jan. 23, 1951 P. H. BRENNAN 2,538,895

NAIL DRIVING DEVICE

Filed Feb. 15, 1949 2 Sheets-Sheet 1

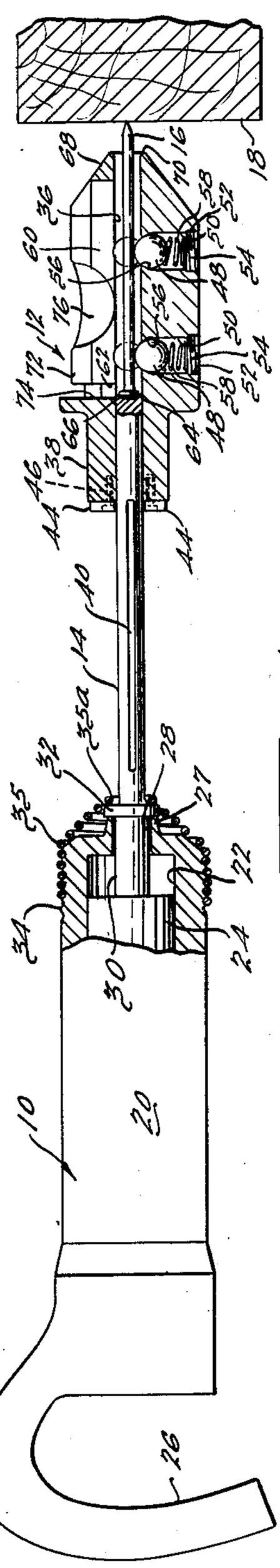

Fig. 1.

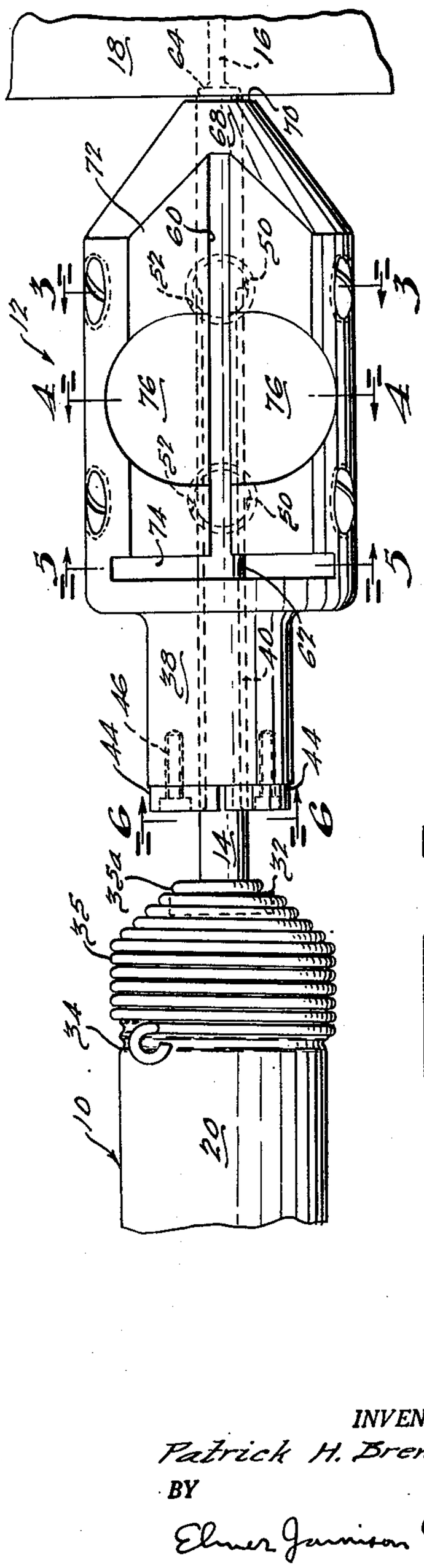

Fig. 2.

INVENTOR.
Patrick H. Brennan.
BY
Elmer Jamison Gary
ATTORNEY.

Jan. 23, 1951 P. H. BRENNAN 2,538,895

NAIL DRIVING DEVICE

Filed Feb. 15, 1949 2 Sheets-Sheet 2

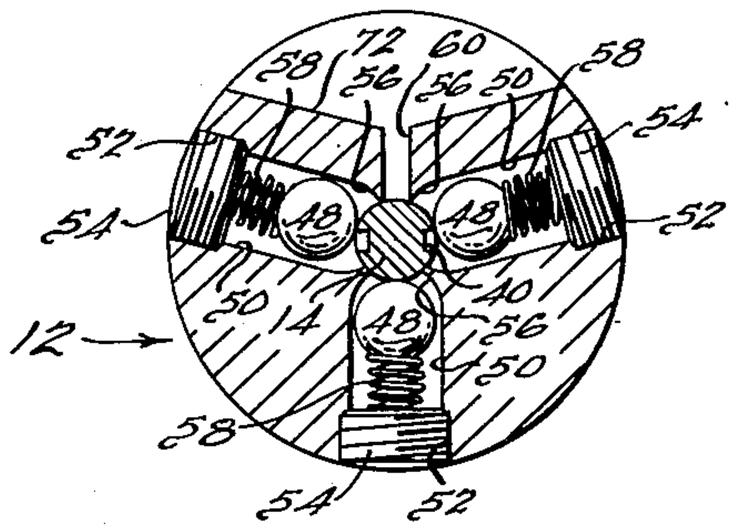

Fig. 3.

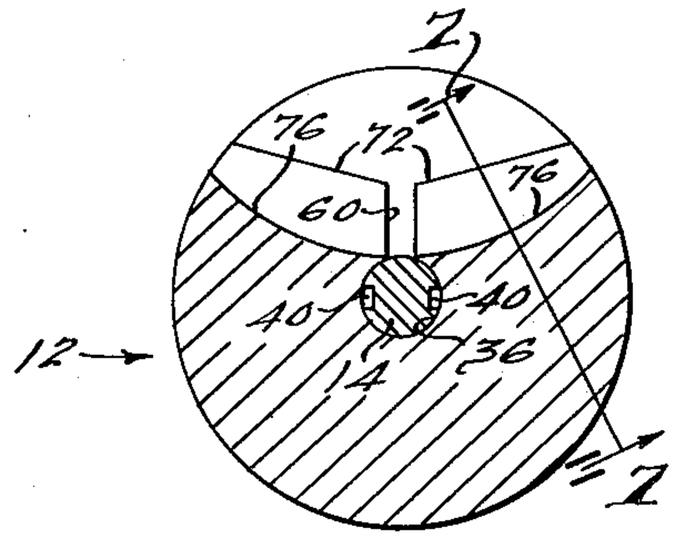

Fig. 4.

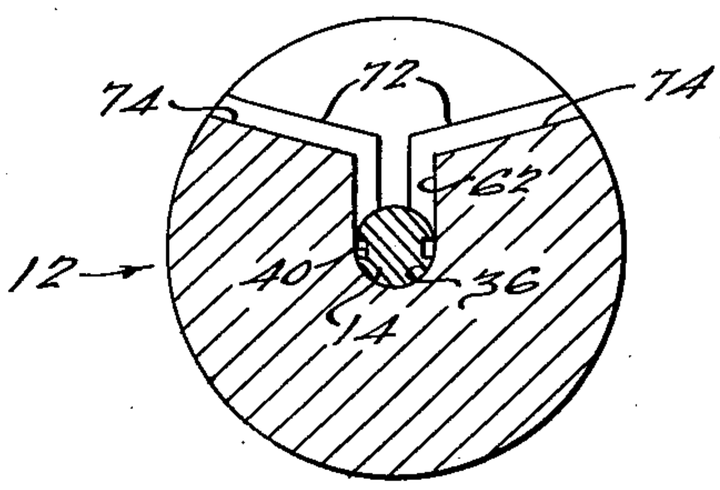

Fig. 5.

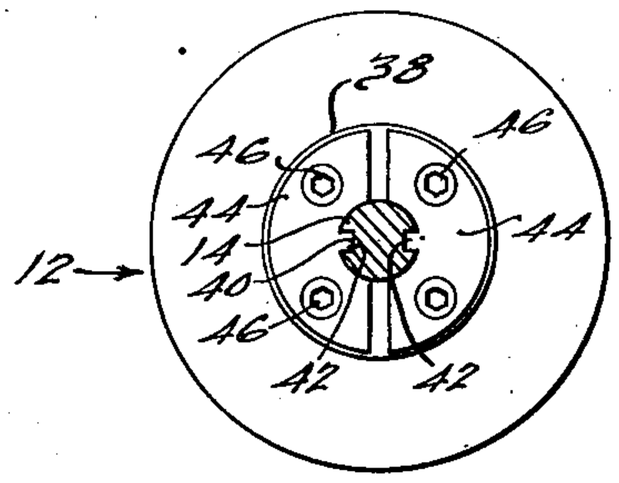

Fig. 6.

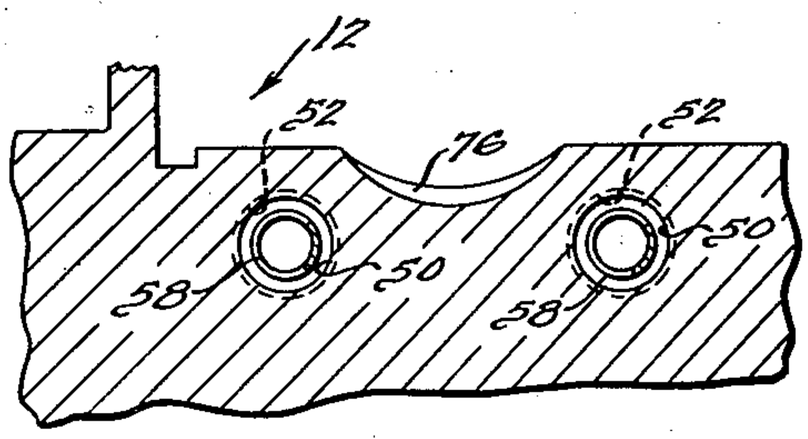

Fig. 7.

INVENTOR.

Patrick H. Brennan.

BY

Elmer Jamison Gray

ATTORNEY.

Patented Jan. 23, 1951 2,538,895

UNITED STATES PATENT OFFICE

2,538,895

NAIL DRIVING DEVICE

Patrick H. Brennan, Detroit, Mich.

Application February 15, 1949, Serial No. 76,543

7 Claims. (Cl. 1—46.1)

1

The present invention relates to an improved nail driving tool and in particular to an attachment which may be readily employed with hand operated power actuated hammers, such as a hand operated pneumatic hammer or conventional types of riveting hammers by way of example.

A primary object of the present invention is to provide an improved nail driving tool of the foregoing character of simplified economical construction which may be readily and conveniently employed with a minimum of skill and effort on the part of the operator, which may be quickly and easily loaded without jamming, and which is positive in its action without reliance upon gravity feed.

Another object is to provide a durable, compact, lightweight and highly efficient nail driving tool of the above class which may be safely used by an inexperienced operator without danger of injury to himself or others or to the work.

Still other objects of the present invention are to provide such a tool having a simple highly efficient guard means adapted to prevent accidental discharge of a nail from the tool during operation and thereby to protect the operator and fellow workers from the possibility of injury which might otherwise result from uncontrolled nails flying through space under the impact of the driving hammer; and to provide such a tool having a simple protective movement limiting means which permits a nail to be driven the full length thereof by the tool and thereafter automatically prevents needless or undesirable countersinking of the nail beyond a predetermined extent regardless of the length of the nail.

Other objects are to provide such a nail driving tool which is readily adaptable for use with nails of various lengths within a given range; to provide a hand loaded nail driving tool having improved means to facilitate loading or feeding of nails to the tool; and to provide such a tool which readily receives the nail to be driven and positively holds the latter in operative position, permitting use of the tool at any convenient angle.

Another object of this invention is to provide a tool embodying a nail driving plunger which may be readily adapted for actuation by conventional types of hand operated power hammers, as for example pneumatic hammers of the type commonly employed for riveting operations.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

2

The above and other objects are accomplished in a preferred embodiment of the present invention comprising a vibratory nail driving member preferably adapted for power actuation by a power driven pneumatic hammer or other hammer means suitably powered for example by electric or hydraulic means whereby a rapid vibratory nail driving motion of small amplitude is imparted to the nail driving member. A nail holding head having a longitudinal nail receiving chamber therein is slidably mounted on the vibratory nail driving member in such a manner that the latter may be moved forward into the chamber to displace a nail therein, whereby the nail is forceably driven from the head through a forward opening of the chamber.

Manual loading of a nail substantially lengthwise into the nail receiving chamber is permitted by a nail receiving slot within the sidewall of the head and opening longitudinally into the chamber. A feed trough extending longitudinally within the upper surface of the nail holding head converges to the nail receiving slot to facilitate loading of a nail thereinto. Thus a nail placed within the span of the trough is readily guided along the converging sidewalls thereof to the nail receiving slot and into the aforementioned chamber.

Proper locating of the nail within the nail receiving chamber with respect to the vibratory member is facilitated by a secondary or nail head receiving trough located in the sides of the aforementioned feed trough at the rearward extremity thereof to receive the enlarged head of the nail and guide the latter to a desired operative position within the nail receiving chamber. In order to permit positive manual control over the nail during the loading operation, central portions of the opposing side walls of the feed trough are deepened to provide rounded finger receiving grooves having the lower portions thereof opening immediately above the nail receiving chamber. Thus the operator, while holding a nail between his thumb and forefinger for example, may place the nail within the confines of the feed trough, with the nail head within the deepened nail head receiving portion thereof. The operator may then follow the nail downward with his fingers along the converging sides of the feed trough and positively force the nail into the nail receiving chamber by final finger pressure on the upper portion of the nail.

Suitable nail retaining means are provided within the nail receiving chamber for yieldingly and frictionally engaging the nail so as to hold the same positively in central alignment in an operative position within the chamber. Accidental displacement of the nail within the chamber or its accidental dropping through the discharge opening of the chamber is thus prevented regardless of the angle at which the tool may be held.

Details of a preferred construction of a nail driving tool embodying the present invention are illustrated by way of example in the following drawings wherein:

Fig. 1 is a fragmentary view partially in longitudinal mid-section and partially in elevation, showing the nail driving tool in operative position for driving a nail into a workpiece.

Fig. 2 is a fragmentary enlarged plan view of the tool and workpiece of Fig. 1, showing the tool in the operative position upon completion of a nail driving operation.

Fig. 3 is a transverse section taken in the direction of the arrows substantially along the line 3—3 of Fig. 2.

Fig. 4 is a transverse section taken in the direction of the arrows substantially along the line 4—4 of Fig. 2.

Fig. 5 is a transverse section taken in the direction of the arrows substantially along the line 5—5 of Fig. 2.

Fig. 6 is a transverse section taken in the direction of the arrows substantially along the line 6—6 of Fig. 2.

Fig. 7 is a longitudinal section taken in the direction of the arrows substantially along the line 7—7 of Fig. 4.

Before explaining the present invention in detail it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

The present invention is described by way of example in connection with a nail driving tool which is readily adaptable for use with a conventional type of pneumatic hammer, indicated by the numeral 10, Figs. 1 and 2. In this instance the tool comprises a generally cylindrical nail holding head, indicated by the numeral 12, slidably mounted on a vibratory nail driving shaft 14 for movement longitudinally thereof. In Fig. 1 a nail 16 is shown held by the head 12 in an operative position preparatory to be driven into a workpiece 18.

Although a preferred application of the present invention is illustrated herein in connection with a pneumatic type of hand operated power actuated hammer, it is to be understood that the present invention is not dependent upon such an application and is readily adaptable for use with other suitable power means, which may be electrically or hydraulically actuated for example to impart a vibratory driving motion to the nail driving shaft 14 as described hereinafter.

The pneumatic hammer 10 in the present instance comprises a body or casing 20 containing a cylindrical bore 22 having a vibratory hammer member 24 therein and pneumatic means, not shown, for imparting a desired vibratory motion of comparatively high frequency and small amplitude to the hammer member 24. The hammer 10 is manually supported by a handle 26 and is provided with connection and trigger means, not shown, whereby air pressure may be suitably supplied through flexible conduits and controlled for selective actuation of the vibratory hammer 24. The forward end of the housing 20 is reduced in diameter to a projecting nose 27 and is provided with a cylindrical shaft holding bore 28 adapted to receive and support the butt portion 30 of the vibratory shaft 14, which is of suitable diameter to effect a snug sliding fit within the bore 28. Integral with the shaft 14 at the forward end of the butt 30 is an annular movement limiting flange 32 suitably located with respect to the dimensions of the hammer 10 so as to abut the nose 27 thereof when the butt 30 is inserted into the bore 28 in abutting relation with the face of the hammer 24.

In the present instance, the forward body portion of the housing 20 is exteriorly screw threaded at 34 to receive a comparatively heavy coil spring 35 dimensioned to be screwed tightly on the threaded portion 34. The forward coils of the spring 35 are of successively decreasing diameter and converge around the reduced nose 27 and flange 32, Fig. 1, with at least one coil 35*a* wrapping around the shaft 14 forward of the flange 32 in a manner for resiliently urging the latter against the nose 27. It will be apparent however that other means may be readily employed for yieldingly holding the shaft 14 in operative position at the limit of its movement toward the hammer 10.

The head 12 may be constructed of any suitable material, preferably a lightweight aluminum or magnesium alloy, and is formed with a generally central bore or nail receiving chamber 36 extending longitudinally therethrough in diameter for conveniently receiving the largest nail head for which the tool is adapted. A rearward extension 38 of the head 12 of reduced exterior diameter is provided with a continuation of the bore or chamber 36 and is adapted to receive the forward end of the shaft 14 on which the head 12 is firmly and securely supported. In this connection, the diameter of the shaft 14 is selected to permit a snug freely sliding fit within the chamber 36.

The limit of relative sliding movement between the head 12 and shaft 14 is determined by paired diametrically opposed guide slots 40 extending longitudinally of the shaft 14, Figs. 1 and 6, within which ride a pair of movement limiting guide lugs 42 projecting into the bore or chamber 36 from paired essentially semi-annular retaining plates 44 suitably secured to the extremity of the extension 38 by a plurality of Allen-type screws 46. The outer peripheries of the retaining plates 44 conform substantially to the reduced diameter of the extension 38, whereas their inner peripheries preferably conform to the diameter of the chamber 36 to comprise substantially a rearward continuation thereof.

In assembly of the tool the forward end of the shaft 14 is inserted into the bore 36 of the extension 38 until the forward extremities of the paired grooves 40 pass the assembled positions of the lugs 42. Thereafter the retaining plates 44 are assembled with their projecting lugs 42 within the grooves 40 and are secured to the extension 38 by the screws 46 to limit the forward movement of the head 12 relative to the shaft 14 and thereby to prevent accidental separation of these members in operation of the

tool. It is also to be observed that the engagement between the lugs 42 and grooves 40 prevents relative rotation between the shaft 14 and head 12. Thus the latter is readily held in an upright operative position during operation of the tool as described hereinafter.

The body of the head 12 forward of the extension 38 is preferably of sufficient diameter and length to accommodate two longitudinally spaced sets of spring pressed nail retaining and centering balls 48, Figs. 1 and 3. Each set comprises three balls 48 spaced circumferentially around the chamber 36, whereby the six balls 48 engage a nail within the chamber 36 at three substantially equi-angularly spaced points at each of two locations spaced longitudinally of the nail. Accordingly the balls 48 are disposed to exert balanced forces on the nail for frictionally holding the same positively against accidental displacement and in central longitudinal alignment within the chamber 36 regardless of the angle at which the tool or head 12 may be held. The balls 48 of each set are contained within three suitably spaced radial wells 50 communicating between the chamber 36 and the exterior of the head 12. The outer opening of each well 50 is adapted to receive its retaining ball 48 and is preferably screw threaded at 52 to receive a retaining screw or plug 54. The base of each well 50 is provided with an inner opening of smaller diameter than the ball 48 communicating with the chamber 36 and comprises an annular seat 56 for the ball 48, whereby the latter is retained within its well 50 but permitted to project partially into the chamber 36. Each ball 48 is resiliently urged into its seated position projected into the chamber 36 by a coil spring 58 under compression between the screw 54 and ball 48.

As indicated in Fig. 3, the equi-angular spacing of the balls 48 is not critical to the efficient operation of the present invention and may be suitably varied to meet particular construction requirements of the tool. In such situations, as in the present instance, the tensions in the spring 58 are adjusted with respect to the circumferential locations of the balls 48 so that the forces exerted thereby on a centrally aligned nail will be substantially balanced.

Preferably, the two upper balls 48 of each set are disposed to project into the chamber 36 at equal lateral angles of attack from opposite sides and somewhat above the longitudinal center line thereof, Fig. 3, so as to exert equal downward forces on opposite sides of a nail within the chamber 36. The lower ball 48 of each set is disposed to project into the chamber 36 from below the mid-line thereof to equalize the vertical forces exerted on the nail by the two upper balls 48. The two upper balls 48 are also preferably disposed so as to meet the cylindrical sides of a nail within the chamber 36 at points above the center line of the nail. Thus immediately upon passage of a nail below the slot 60 and into the chamber 36, the nail will be snapped into the aforesaid central longitudinal alignment by the action of the spring pressed balls 48.

Loading or feeding of a nail 16 into the chamber 36 is readily permitted through a nail receiving slot 60, Figs. 1 through 5, which extends longitudinally of the chamber 36 and opens to the exterior of the head 12 through the upper sidewall thereof. The slot 60 terminates rearwardly at a nail head receiving enlargement 62 of substantially the diameter of the chamber 36, Figs.

2 and 5, so as to receive the enlarged head 64 of the nail 16. The nail head receiving slot portion 64 is located just forward of the nail head centering concavity 66 at the forward extremity of the shaft 14. Thus when a nail 16 is inserted into the chamber 36 in the manner described hereinafter, with its head 64 passing through the slot portion 62, the nail 16 will lie within the chamber 36 substantially as shown in Fig. 1. In this position the shaft 14 will be at the rearward limit of movement relative to the head 12 permitted by the studs 42 within the grooves 40. The nail head 64 will thus be adjacent the shaft extremity 66 in position to be driven forward through the chamber 36 upon forward relative movement of the shaft 14. By virtue of the concave extremity of the shaft 14, the head 64 will be continually centered within the chamber 36 during a nail driving operation. Thus the dangerous tendency to cock a nail out of longitudinal alignment within the chamber 36, whereby the nail may be accidentally shot through the slots 60, 62 by the impact of a nail driving operation, is minimized. This safeguard is especially important with the use of so called headless or finishing nails which would otherwise be particularly subject to accidental discharge from the slots 60, 62 in operation of the tool.

The nail receiving slot 60 extends forward from the slot 62 sufficiently to permit substantially lengthwise passage into the chamber 36 of a nail of average length which the tool is intended to handle. The forward end of the slot 60 terminates at a forward annular guard portion 68 of the head 12 comprising an annular sidewall enclosure for the forward end of the chamber 36. The forward tip or nose 70 of the guard 68 is flattened or blunted to permit pressure against a workpiece 18 without the danger of damaging the latter by being embedded therein under the impact of a nail driving operation. As will be apparent hereinafter, the annular guard portion 68 serves as an efficient safety measure to prevent the accidental discharge of a nail through the slot 60 during the initial impact of a hammering or nail driving operation, particularly before the point of the nail is securely embedded within the work 18.

An important feature of the present invention is the means whereby rapid manual loading of the chamber 36 with a nail to be driven is readily accomplished. To this end the upper portion of the head 12 is provided with a longitudinally extending groove or trough 72 of V-shaped cross-section which converges at its base to the nail receiving slot 60. The nail may be placed by the operator anywhere on the upper portion of the head 12 within the span of the trough 72 and substantially longitudinally thereof. The trough 72 will then guide the nail into the slot 60 without undue effort or skill on the part of the operator. A slightly deeper nail head receiving portion 74 of the trough 72 is provided at the rearward extremity of the latter, Figs. 2 and 5, directly over the enlarged nail head receiving opening 62.

As indicated in Fig. 5, the depth of the trough portion 74 with respect to the trough 72 is selected to accommodate nail heads of the largest diameter which may be conveniently retained within the chamber 36. Accordingly when a nail is placed with its body within the trough 72 and its enlarged head within the trough 74, the nail is readily guided toward the nail receiving slots

60, 62 by the converging walls of the respective troughs 72, 74.

In order to simplify further the loading of the chamber 36 and to permit positive control of the nail by the operator during the loading operation, rounded central finger grooves 76 are provided within the opposed sidewalls of the trough 72. In the present instance the grooves 76 are formed by a substantially spherical cut into the upper surface of the head 12 and sidewalls of the trough 72, Figs. 1, 2, 4 and 7, with the lowest points of the spherical cut meeting the base of the sidewalls of the slot 60 at the opening of the latter into the chamber 36, Fig. 4. Accordingly as a nail held within the fingers of the operator is fed into the chamber 36, the fingers are readily guided by the rounded finger grooves 76 directly to the upper opening of the chamber 36 at the lowermost region of the paired converging grooves 76. The nail may then be forced by finger pressure below the level of the base of the slot 60 whereat the two upper balls 48 of each set will engage the cylindrical sides of the nail above the center line thereof and exert a downward force thereon to force the nail into the centered operative position within the chamber 36.

In operation of the tool, the assembled head 12 and shaft 14 are connected with the hammer 10 as shown in Fig. 1. The shaft butt 30 is inserted into the retaining bore 28 therefor in abutting engagement with the vibratory power operated hammer member 24 and with the movement limiting flange 32 seated firmly against the nose 27, whereat it is resiliently held in the seated position by the coil spring 35, 35*a* screwed on the threaded housing portion 34. The head 12 is then slid forward along the shaft 14 to the nail loading position at the forward limit of movement permitted by the studs 42 riding within the slots 40, Fig. 1. At this position, the concave centering extremity 66 of the shaft 14 will lie immediately to the rear of the nail head receiving slot 62.

While holding a nail between his fingers, as for example between his thumb and index finger, the operator then readily places the nail within the span of the V-troughs 72, 74 with the body of the nail within the trough 72 and the head of the nail within the trough 74, and slides the nail by a guided downward movement along the converging sides of the troughs 72, 74 to the upper openings of the slots 60, 62. In substantially the same motion, while the head of the nail is confined by the sidewalls of the nail head holding trough 74, the operator slides his fingers along the length of the nail without releasing his grip thereon to the paired rounded finger grooves 76 which guide the fingers to a point at the lowermost portion of the grooves 76 immediately above the lower opening of the slot 60 into the chamber 36. The nail is accordingly moved downward through the slots 60, 62 to a position of alignment for reception by the chamber 36. Upon continued pressure on the nail from above by the thumb or forefinger, the nail is readily forced below the slots 60, 62 whereat the sides of the nail are engaged by the paired sets of spring pressed upper balls 48 and snapped into central position within the chamber 36.

If a nail such as the nail 16 is employed which is longer than the length of the slots 60, 62, the nail is preferably inserted angularly downward into the slot 60 with the nail point foremost until the latter projects through the annular guard

68 sufficiently to permit the nail head 64 to drop through the slot portion 62.

The loaded tool is firmly held by the operator with the blunted nose 70 adjacent the work 18 or with the point of the nail 16 adjacent the work 18, as the case may be if the nail 16 is of sufficient length to project beyond the nose 70, at the location and desired angle at which the nail is to be driven into the workpiece 18. The operator then actuates the hammer 10 in accordance with conventional practice to effect a power driven high frequency vibratory motion of small amplitude to the hammer member 24. The repeated impacts of the vibratory hammer member 24 are imparted to the head of the nail through the vibratory shaft 14, driving the nail into the work 18. In this connection, the rounded concave forward extremity 66 of the shaft 14 serves to center the nail head and is particularly useful where headless or small headed finishing nails are employed. Thus the nail is driven longitudinally of the shaft 14 directly into the work 18. The danger of imparting a glancing or angular impact to the nail head which might cause the nail to fly from the head 12 through the slot 60 is minimized. Likewise, particularly in the situation where the length of the nail is shorter than the length of the slot 60, the annular nose guard 68 around the forward extremity of the chamber 36 retains the nail against accidental discharge through the slot 60, particularly during the initial stages of the nail driving operation before the point of the nail is secured within the work 18.

As the nail is driven into the work 18, the vibratory shaft 14 gradually moves forward within the chamber 36, driving the nail through the annular nose 68 or discharge end of the chamber 36 until the guide lugs 42 riding within the slots 40 engage the shaft 14 at the rearward extremity of the slots 40 and prevent further relative forward movement of the shaft 14 with respect to the head 12.

The length of the slots 40 is preferably determined so that the forward extremity 66 of the shaft 14 will just reach or slightly clear the forward discharge end 68 of the chamber 36 at the same time the lugs 42 reach the ends of the slots 40, Fig. 2. The nail will be driven its full length into the work 18, whereupon continued forward movement of the shaft 14 is stopped and injury to the work 18 by undesirable countersinking is avoided regardless whether the vibratory driving power is immediately discontinued or not. Likewise injury to the work 18 by the head 12 is also avoided by the blunted nose 70 of the latter which preferably provides sufficient area to abut the work 18 without being driven into the same by the ordinary vibratory impacts of the hammer member 24.

Obviously, the length of the slots 40 may be predetermined to limit the countersinking of the nail to any desired extent or to prevent any appreciable countersinking. By removing the retaining plates 44 from the head 12 and the coil spring 35 from the hammer 10, the shaft 14 may be readily removed and replaced by a similar shaft 14 having guide grooves 40 of a different length where it is desired to change the extent of countersinking permitted by the tool.

I claim:

1. In a nail driving tool, a nail holding head having a longitudinal nail receiving chamber therein, said head having a longitudinal nail feeding slot in the sidewall thereof in communication

with said chamber to permit substantially lengthwise passage of a nail into said chamber and also having a nail discharge opening in an end thereof, a vibratory nail driving member movable within said chamber to drive a nail therein through said discharge opening, and means to facilitate manual feeding of a nail substantially lengthwise into said chamber through said nail feeding slot and including a trough in the sidewall of said head extending longitudinally of said chamber and converging to said nail feeding slot.

2. In a nail driving tool, a nail holding head having a longitudinal nail receiving chamber therein, said head having a longitudinal nail feeding slot in the sidewall thereof in communication with said chamber to permit substantially lengthwise passage of a nail into said chamber and also having a nail discharge opening in an end thereof, a vibratory nail driving member movable within said chamber to drive a nail therein through said discharge opening, means to facilitate manual feeding of a nail substantially lengthwise into said chamber through said nail feeding slot and including a trough in the sidewall of said head extending longitudinally of said chamber and converging to said nail feeding slot, and means to facilitate manual insertion of a nail through said nail feeding slot and including finger recesses in opposed sidewalls of said trough.

3. In a nail driving tool, a nail holding head having a longitudinal nail receiving chamber therein, said head having a longitudinal nail feeding slot in the sidewall thereof in communication with said chamber to permit substantially lengthwise passage of a nail into said chamber and also having a nail discharge opening in an end thereof, a vibratory nail driving member movable within said chamber to drive a nail therein through said discharge opening, means to facilitate manual feeding of a nail substantially lengthwise into said chamber through said nail feeding slot and including a trough in the sidewall of said head extending longitudinally of said chamber and converging to said nail feeding slot, means to guide a nail into operative driving position within said chamber with the head of the nail adjacent said driving member and including a transverse nail-head guide slot in the sidewall of said trough and leading to said feeding slot.

4. In a nail driving tool, a nail holding head having a longitudinal nail receiving chamber therein, said head having a longitudinal nail feeding slot in the sidewall thereof in communication with said chamber to permit substantially lengthwise passage of a nail into said chamber and also having a nail discharge opening in an end thereof, a vibratory nail driving member movable within said chamber to drive a nail

therein through said discharge opening, means to facilitate manual feeding of a nail substantially lengthwise into said chamber through said nail feeding slot and including a trough in the sidewall of said head extending longitudinally of said chamber and converging to said nail feeding slot, means to facilitate manual insertion of a nail through said nail feeding slot and including finger recesses in opposed sidewalls of said trough, and means to guide a nail into operative driving position within said chamber with the head of the nail adjacent said driving member and including a transverse nail-head guide slot in the sidewall of said trough and leading to said feeding slot.

5. In a nail driving tool, a nail holding head having a nail receiving chamber therein communicating with a discharge opening, said head also having a nail feed trough communicating inwardly with said chamber and diverging outwardly to facilitate feeding a nail into said chamber, and a nail driving member movable within said chamber to drive a nail therefrom through said discharge opening.

6. In a nail driving tool, a nail holding head having a nail receiving chamber therein communicating with a discharge opening, said head also having a nail feed trough communicating inwardly with said chamber and diverging outwardl to guide a nail into said chamber, said trough having finger recesses in opposed sidewalls thereof to facilitate manual insertion of a nail thereinto, and a nail driving member movable within said chamber to drive the nail therefrom through said discharge opening.

7. In a nail driving tool, a nail holding head having a nail receiving chamber therein communicating with a discharge opening, said head also having a nail feed trough communicating inwardly with said chamber and diverging outwardly to guide a nail into said chamber, said trough having a nail-head guide slot in the sidewall thereof leading to said chamber for guiding the head of the nail to a predetermined position within the chamber, and a nail driving member movable within said chamber to drive the nail therefrom through said discharge opening.

PATRICK H. BRENNAN.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
1,539,473	Ellwood	May 26, 1925
1,604,675	Bernard	Oct. 26, 1926
2,009,580	Govanus	July 30, 1935
2,078,012	Newell	Apr. 20, 1937