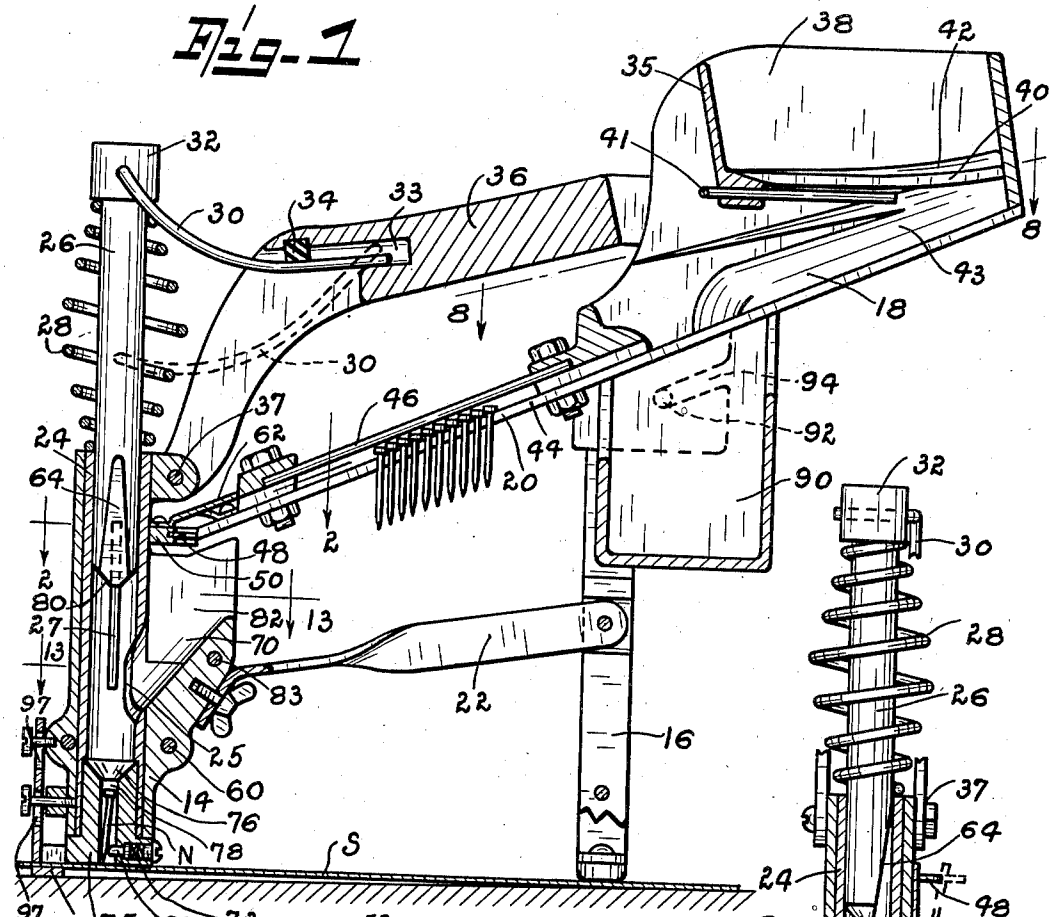
April 8, 1941. F. THAYER 2,237,458

NAIL DRIVING AND SETTING MACHINE

Filed Dec. 16, 1938 2 Sheets-Sheet 1

Fig. 1



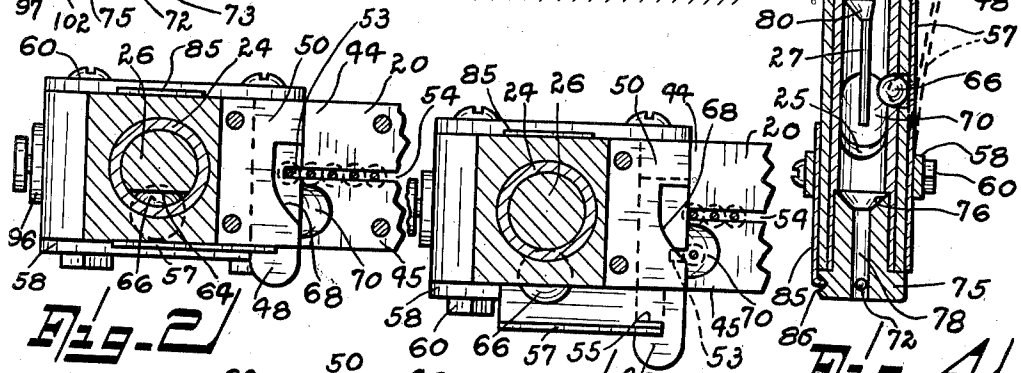


Fig. 2

Fig. 3

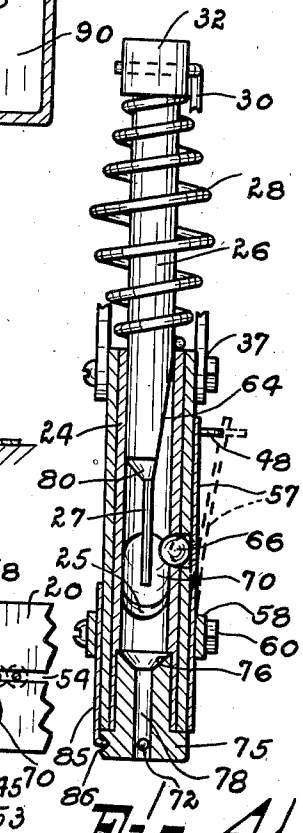


Fig. 4

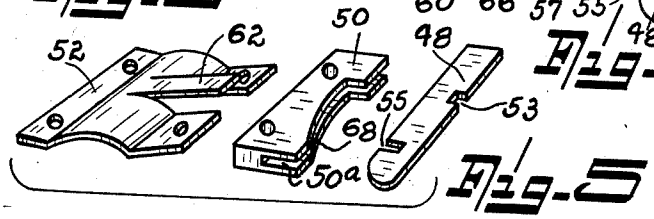


Fig. 5

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Fig. 6

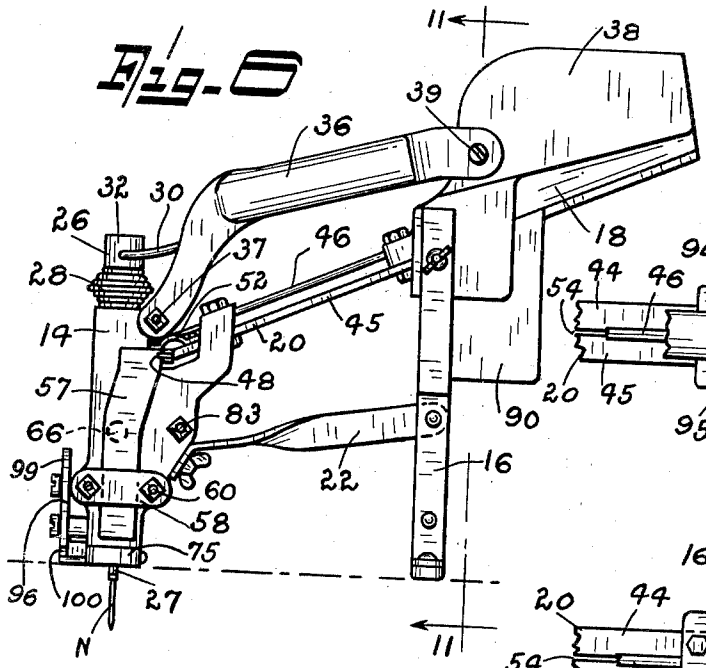


Fig. 7

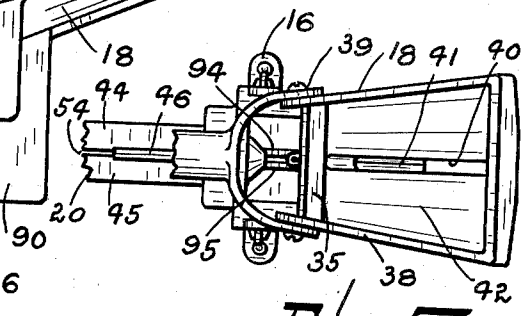


Fig. 8

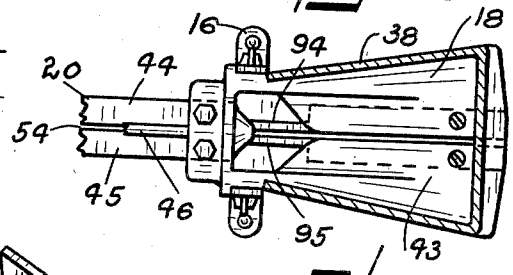


Fig. 9

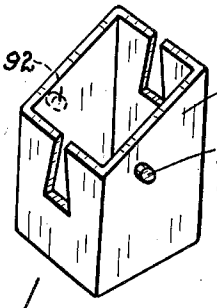


Fig. 10

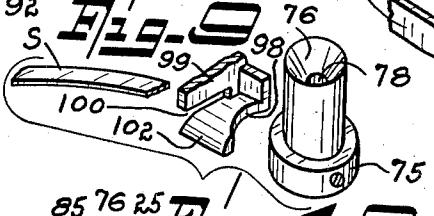


Fig. 11

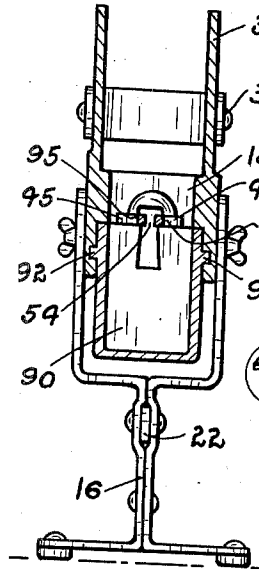


Fig. 12

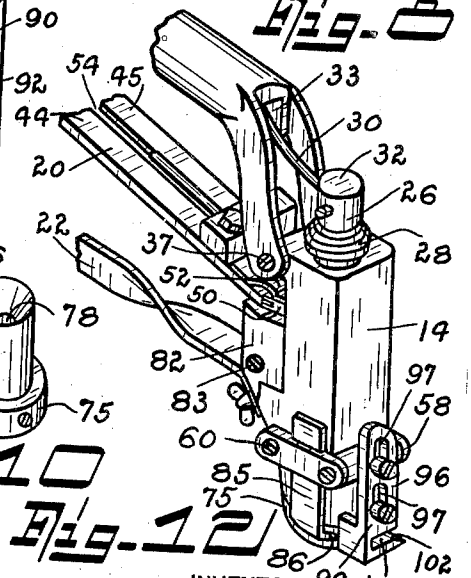
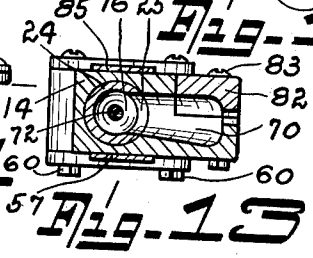


Fig. 13



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Patented Apr. 8, 1941 2,237,458

UNITED STATES PATENT OFFICE

2,237,458

NAIL DRIVING AND SETTING MACHINE

Fred Thayer, Seattle, Wash.

Application December 16, 1938, Serial No. 246,190

4 Claims. (Cl. 1—46)

My present invention relates to the art of nailing machines and more particularly to a nailing device which provides both nail driving and nail setting.

My invention consists in providing means for feeding nails in a manner to permit their ready introduction into a driving head and then to provide means for accurately driving the nail and setting it to the depth desired. Such a machine is particularly adapted for nailing of thin hard wood floors and the like where it is common to drive in a large number of nails, usually short and not easy to handle by hand, and then to set the same accurately to a predetermined depth so that puttying and final finishing can be easily effected. There are many other uses for such a machine, however, particularly in plywood fabrication which is becoming more popular, especially where plywood panels are built up with studding members and the like so as to provide wall sections.

Throughout my specification and the accompanying drawings I have illustrated my device as a hand nailing machine; however, it will be readily observed, it is believed, that with the addition of a power striking means the majority of the parts of my present device will readily lend themselves for use in power nailing machines, such as are used in the fabrication of boxes, panels, and the like.

The principal objects of my present invention are to provide means of the general character described which provides for the automatic feeding of nails into the proper position for driving; to provide means for the proper guiding of the nails so that they will be truly driven into the material upon which the machine is used; and, further, to provide means for countersinking the nails to the desired depth.

Another important object of my present invention is to provide means that will permit the rapid nailing of materials particularly where short nails, difficult to hold, are driven in large quantities.

A further object of my present invention is to provide means which make it possible to quickly remedy any malfunctioning of the device which may result from improperly formed, or bent, nails.

Other and more specific objects will be apparent from the following description taken in connection with the accompanying drawings, wherein

Figure 1 is an elevation, in section, taken along the center of my nail feeding and driving means.

Figure 2 is a cross-sectional view taken along the line 2—2 of Figure 1.

Figure 3 is a cross-sectional view taken along the line 2—2 of Figure 1, but showing the nail driving and setting plunger and associated parts in their driving position.

Figure 4 is a vertical, sectional view through the driving head of my device taken in a plane at right angles to that of Figure 1.

Figure 5 is a bracketed view showing the means employed for transferring the nails from the feeding slide to the driving cylinder.

Figure 6 is a side elevation of my device showing the driving plunger in the position assumed when setting a nail below the surface upon which the nailing device rests.

Figure 7 is a top plan view of the feeding hopper employed in my device.

Figure 8 is a cross-sectional view taken along the line 8—8 of Figure 1.

Figure 9 is a perspective view showing the nail salvaging container which is adapted to receive nails that do not properly enter the guideway.

Figure 10 is a perspective view showing the guide bushing or nail box used with my device.

Figure 11 is a cross-sectional view taken along the line 11—11 of Figure 6.

Figure 12 is a fragmentary, perspective view, showing the driving head of my device with the plunger in its down position.

Figure 13 is a cross-sectional view taken along the line 13—13 of Figure 1.

Referring to the drawings, throughout which like reference characters indicate like parts, 14 designates the housing employed to position and guide the nail setting plunger and its associated parts. It is normally held in a vertical position by a support, provided at 16, which is secured to the nail storage means 18. This unit is connected, by the parts making up nail guide 20, to the upper portion of housing 14. The lower portion of housing 14 is connected to support 16 by brace 22. In this manner a somewhat flexible, but adequate, means is provided for holding the housing in substantially a vertical position. This is essential to the successful operation of the device in that gravity is relied upon to feed, and position the nails so that they will feed properly into the striker means. In order to provide an economical construction and to further assist in the replacement incidental to wear, the bore of housing 14 is provided with a liner 24. This liner is cut away on one side, at 25, to

admit the nails into their final position before driving.

Adapted to reciprocate within liner 24 is the driving plunger 26. This member has inserted into its lower end a nail driving and setting tip 27 which provides a convenient means of forming the reduced portion of the plunger. Plunger 26 is normally held in its uppermost position by the retracting spring 28. Its upward movement, however, is limited by a resilient stop spring 30 which is secured at one end to the plunger head, or striking portion 32. The other end is slidably engaged within slot 33 and a replaceable stop member, preferably of resilient material as 34, is provided so as to limit the upward movement of plunger 26. Handle 36 is pivoted at each end, being secured to housing 14 at 37 and to hopper 38 at 39. In this manner vibration and jarring which is so desirable in the feeding of the nails can be easily transmitted from the driving head to the hopper and nail guiding means.

Frictionally held in hopper 38 is a removable member 35 which is preferably provided with a bottom 42 that slopes both ways to the center opening, or slot, 40. Disposed below slot 40 is the control pin 41. This may be a split pin preferably, so that it can be adjusted to any desirable position and will be held in that position by frictional engagement. This provides, in effect, means for reducing the length of slot 40 and thus controls the flow of the nails to the nail guide 20. Below hopper bottom 42 are positioned sloping side plates 43 which guide the nails discharged through slot 40 into the nail guide 20 which is formed by the two spaced members 44 and 45. These members, after the showing particularly of Figure 1, are inclined and spaced sufficiently so that the bodies of the nails will pass through the opening between the two bars but the heads are retained by the upper surfaces of these members and thus the nails are held point down and because of the vibration, caused by the driving blows, of the entire device they are carried down the guideway to the nail selecting means. A cover plate 46 is provided so that the nails once properly entered in the nail guide cannot bounce out of the same, or pile up one on the other, as might otherwise occur in use.

The nail selecting means is illustrated in Figures 2, 3, 4, and 5 and consists essentially of the selector plate 48 which is disposed across the lower ends of the guide bars 44 which form the guide 20, the selector plate guideway 50, and the cover plate 52. The selector plate 48 is adapted for transverse reciprocation within guideway 50*a* and is itself provided with a notch at 53 which, during the selecting operation, is positioned in line to receive a single nail from the gravity feed slot 54 in nail guide 20. It is provided at its opposite end with a second notch 55 which is adapted to receive spring 57. This spring is suitably secured as by plate 58 to housing 14. As a matter of convenience this plate, in turn, is secured in place on bolts or studs 60. Plate 48 is held in slot 50*a* by placing it in abutting relationship with raceway members 44 and 45 as is probably best illustrated in Figure 1. Cover plate 52 which is held in position on guide 50, as by screws, serves to support the ends of members 44 and 45 and the upwardly formed tongue 62 acts in the same manner as cover plate 46.

Spring 57 which is positioned to normally hold plate 48 in the position shown in Figure 2, is operated during the driving cycle by the action of cam 64, which is formed as part of plunger 26. As the plunger is driven down in the process of driving and setting one nail, it comes in contact with ball 66 and in this manner forces spring 57 outwardly away from housing 14, after the showing in dotted line in Figure 4. As the spring 57 is thus pressed outwardly, it also shifts the plate 48 with it, and the plate carries a nail in its notch 53. The guide 50 is fashioned with a cam edge or edges 68, along which the nail slides, and these edges force the nail from the notch so that the nail is released to drop by gravity into an inclined feed chute 70. This nail-feeding operation of the plate 48 is timed so that the slower gravity feed of the nail, initiated by the descent of the plunger, lags behind the quick descent and rebound of the plunger, thereby permitting the nail to slip through chute 70, after the rebound of the plunger, into the nail box within the housing 14. The nail, which is dropped point first slides down this incline, through opening 25 and comes to rest point lowermost against stop 72 after the showing of Figure 1. This stop is held in position by spring 73. The positioning of nail N is accomplished in the final stages of its movement by providing that guide bushing or nail box 75 be formed with a conical counterbore at 76 so as to guide the nail into the reduced bore 78. This bore normally is made of a diameter just sufficient to safely pass the head of the nail used, and for different types of nails this member 75 must be changed. It will be observed it is believed from a study of Figures 1 and 4 particularly that when head 32 is struck as with a mallet or in case of power operation by any suitable driving means, that plunger 26 will be driven downwardly against spring 28, forcing the nail into its receiving surface and setting the same to the desired depth which is controlled by the length of the nail setting tip 27. Normally the lower end of plunger 26 is formed with a tapered or conical end 80 which matches the taper of the guide counterbore 76 so as to form a definite stop. It will be apparent it is believed that by changing the length of set member 27, the nail may be set to any predetermined depth.

Inasmuch as nails are made in large quantities and particularly in view of the fact that some nails are treated as by galvanizing, for instance, after being made, imperfections of, or damage to, the nails may cause them to malfunction in this device. If the nails pile up or otherwise fail to function above bushing or nail box 75 the condition can be cleared by removing a portion 82 of housing 14. This is accomplished by removing screw 83 and when so removed, easy access is made into opening 25 so that clearance can be readily effected. If the nails, however, malfunction in the guide bushing 75, clearance may be effected by moving the retaining spring 85 (see Fig. 4) outwardly so as to retract its inturned end from slot 86 formed in bushing 75. It has been found, however, that for certain types of use, particularly in nailing flooring where my device is normally not raised from the floor, that time may be saved by not employing the retaining spring 85. When that is done malfunctioning in the bushing can be easily cleared by merely raising the whole device off bushing 75 and as soon as clearance is effected the device can then be set back over the nail box. This means quite a saving in time during certain operations. When, however, my device is used for nailing boxes or in

the building up of plywood panels and the like the retaining spring is desirable for unless the bushing 75 is definitely held in position it will not be raised with the machine.

At times, nails being fed from hopper 38, through slot 40, will not properly engage in opening 54 in the nail guideway, or too many may be fed into it and some means must be used to overcome the inconvenience of taking care of the removal of these nails. A convenient means is provided in the nail salvaging box 90. This I detachably secure to the housing assembly 18 as by means of the outwardly extending detents 92 which are adapted to engage in downwardly sloping slots, 94. At a point over slot 40 I have reduced the width of members 44 and 45 as probably best shown in Figures 8 and 11. Here by cutting away portions of the guide members, as at 94 and 95, any nails not properly started in the nail guide will overflow into box 90 and when the same has collected a reasonably large number of such nails the box can be easily removed and the nails dumped back into hopper 38.

My device, if made according to the foregoing description, will be entirely satisfactory for all nailing purposes normally encountered in the laying of floors, the fabrication of boxes and wood panels, and the like. However, there are instances when it is desirable to adapt my device to nailing in place metal binding strips, that are used to reinforce boxes and crates of various kinds and often used to bind materials together such as box shooks, and the like. For such uses it is desirable to provide means which will in a single operation drive the securing nail and also shear off the metal strip so that the same will be cut to the exact length after the nail that holds it in place has been driven. To accomplish this purpose I provide an attachment for my device; this attachment is shown in Figures 1, 6, 10 and 12.

To provide a shear to sever the metal strip S I first provide that the end of member 75 be provided with a lower periphery that is ground to a sharp corner and adequately heat treated so as to provide a shear member. Adapted for use with this member is a strip guide and shear member 96. This may be secured to housing 14 in any convenient manner as by the plurality of screws illustrated, but whatever means employed it should permit of some vertical movement of member 96. In the present showing I have illustrated means for accomplishing this by providing slots at 97 so that shear member 96 is held in axial alinement but is capable of axial movement with respect to plunger 26. The lower portion of shear member 96 is probably best illustrated in Figure 10; here a circular shearing portion 98 is provided which coacts with the sharpened lower margin of member 75 to provide the two shear members. The upwardly disposed guide for member 96 as 99 is undercut at 100 sufficiently so that strip S may be seated therein and further as a convenience in operation the foot 102 is formed with a knife-like margin so that it can slip under and pick up strip S most conveniently.

The manner of using my shearing means is probably best illustrated in Figure 1; here the strip S is shown in a position ready for nailing by nail N and when the nail set 27 has driven the nail home the conical end 80 of plunger 26 will come to rest in the conical female portion 76 of guide 75 and drive this guide member and frame downwardly. It will be noted that strip S rests upon foot 102 and as guide member 75 is driven downwardly member 75 and circular shearing portion 98 of member 96 provide an ideal shearing operation which as the final operation shears strip S to a satisfactory length. This of course can only occur after nail N has been driven home.

The foregoing description and the accompanying drawings are believed to clearly disclose a preferred embodiment of my invention but it will be understood that this disclosure is merely illustrative and that such changes in the invention may be made as are fairly within the scope and spirit of the following claims:

1. In a portable nailing machine of the reciprocable plunger type, the combination with a main frame and plunger-housing having a nail inlet, a hopper, and a handle uniting the hopper and housing, of a slotted inclined nail-chute uniting the hopper and housing, a removable elevated bottom in the hopper having a feed-slot, and means for regulating the length of said feed slot.

2. In a portable nailing machine of the gravity-feed and reciprocable plunger type, the combination with a main frame, a plunger-housing having a nail inlet, a hopper, and a handle uniting the hopper and housing, of a slotted-inclined nail chute rigid with the hopper at one end and terminating at its other end above said inlet, a slotted elevated bottom in the hopper, and an adjustable regulating pin mounted in a bottom wall of the hopper beneath said slotted elevated bottom.

3. In a nail-feeding mechanism for a nailing machine, the combination with a hopper having an elevated, interior, slotted-bottom and an adjustable pin for regulating the length of the bottom-slot, of an inclined slotted chute rigid with the hopper and having a portion forming an exterior bottom of the hopper, an automatically opened gate slidably transversely of the lower end of the slotted chute and automatic means for closing said gate, and an over-head guide for the nails mounted on the chute.

4. In a nailing machine, the combination with a housing, a main frame, and a handle uniting the frame and housing, of a reciprocable plunger mounted in the housing and provided with a striking-head, a retracting spring interposed between said head and the housing, and a cushion-spring mounted between said head and handle to limit the upward movement of the plunger.

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