Sept. 13, 1932. W. A. DAY 1,877,162

PORTABLE NAILING MACHINE

Filed Jan. 29, 1931 3 Sheets-Sheet 1

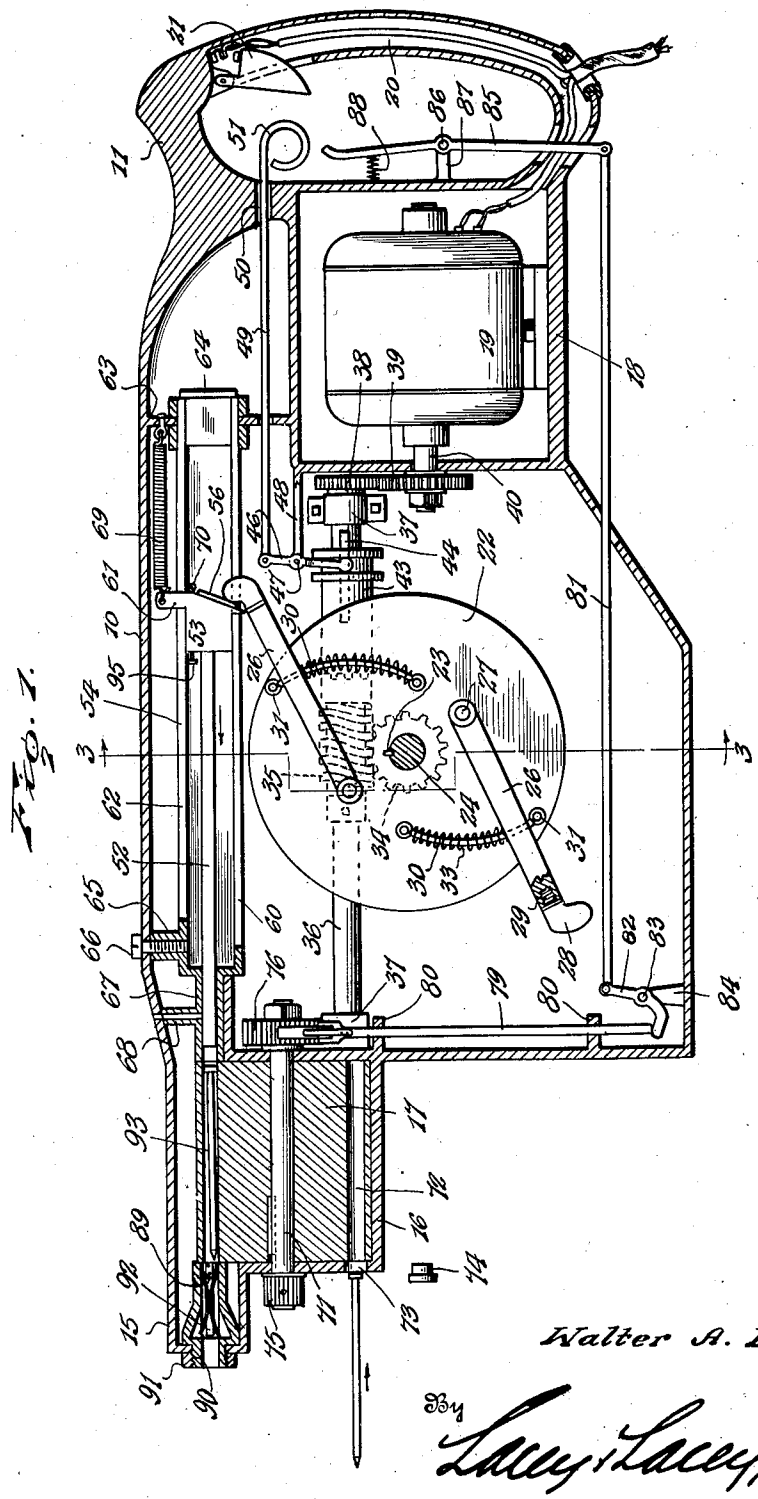


Fig. 1.

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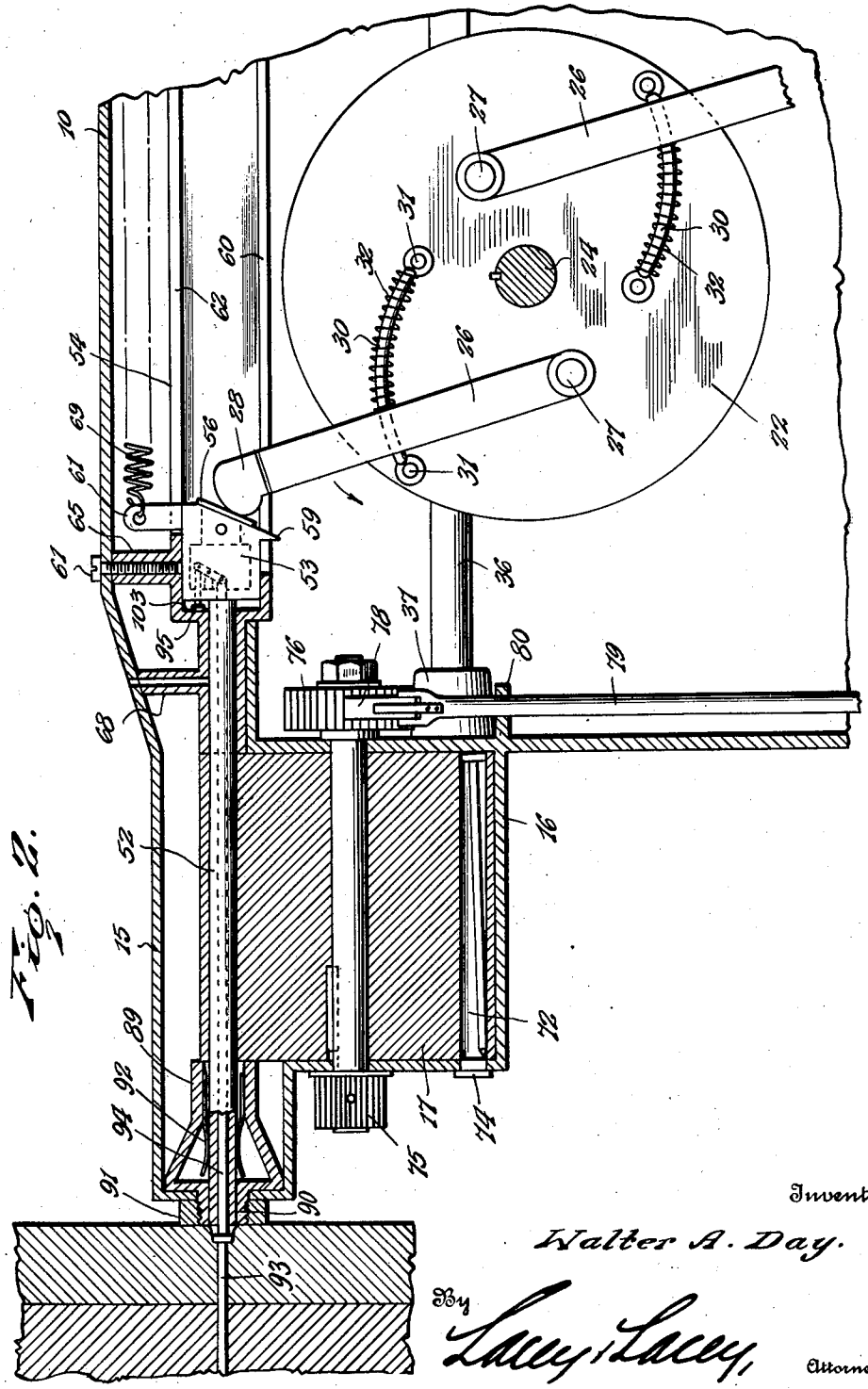


Fig. 2.

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Fig. 5.

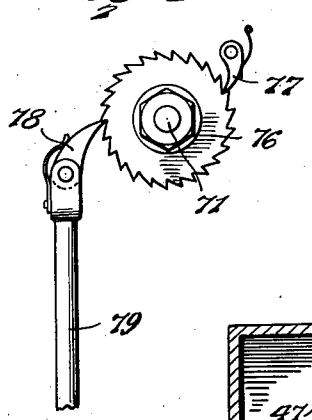


Fig. 3.

Fig. 4.

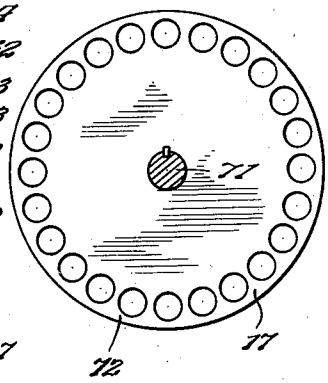


Fig. 6.

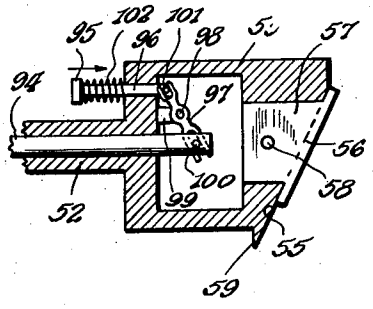
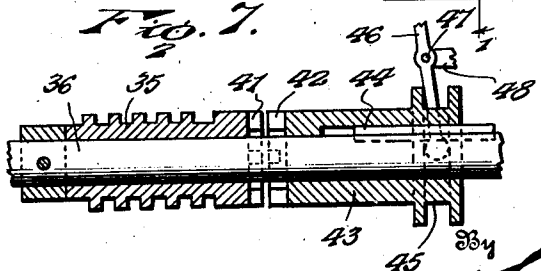


Fig. 7.



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UNITED STATES PATENT OFFICE

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PORTABLE NAILING MACHINE

Application filed January 29, 1931. Serial No. 512,132.

This invention relates to portable nailing machines.

One of the objects is to provide a novel rapid blow hammer for actuating the driver, the device including centrifugal hammers pivoted eccentrically on a power driven disk and being adapted to ride off of the driver against the tension of a spring after each blow.

A second object is to provide a novel feed cylinder and magazine for positioning the nails rapidly to be struck by the driver in succession.

A third object is to provide a novel nail setter which operates to counter-sink the nail when the driver reaches its limit of movement.

A fourth object is to provide a manually operatable clutch for coupling the rapid blow hammer to the motor, and which, when released, permits the rapid blow hammer being returned to initial starting position by the driver controlling spring after each nailing operation is completed.

A fifth object is to provide an automatic nailing machine which will be composed of a few simple, strong and durable parts which may be manufactured at minimum cost and which will not easily get out of order.

With the above and other objects in view the invention consists in certain novel details of construction and combinations of parts hereinafter fully described and claimed, it being understood that various modifications may be resorted to within the scope of the appended claims without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings forming part of this specification:

Figure 1 is a longitudinal sectional view through my improved portable nailing machine taken on the line 1—1 of Fig. 3,

Fig. 2 is an enlarged detail sectional view of the front portion of the machine, showing the operation of the nail setter,

Fig. 3 is a cross sectional view taken on the line 3—3 of Fig. 1, with parts in elevation,

Fig. 4 is a front elevation of the feed cylinder with its shaft shown in section,

Fig. 5 is a detail elevation of the ratchet and pawl control for the feed cylinder,

Fig. 6 is an enlarged fragmentary sectional view of the nail setter actuating mechanism, and

Fig. 7 is a detail sectional view of the control clutch of the rapid blow hammer.

Referring now to the drawings in which like characters of reference designate similar parts in the various views, 10 designates a casing which houses the operating mechanism of the device, the same terminating at the rear end in a grip 11. The casing is preferably formed sectional to permit of assembly and disassembly of the parts, and may be constructed, as best shown in Fig. 3, to comprise a main section 12 and a cover plate 13 secured to the main section by screws 14. The casing terminates at the front in a barrel 15 and, in rear of and below the barrel, is formed cylindrical to provide a housing 16 for the nail magazine and feed cylinder 17. Near the grip 11 the casing is shaped to provide a housing 18 for an electric motor 19. The grip 11 is hollow and houses the conductor wires 20 of the motor, as well as a switch, designated in general by the numeral 21, for opening and closing the circuit to the motor.

The rapid blow hammer mechanism comprises a plate or disk 22 which is keyed, as shown at 23, to a stub shaft 24 which is journaled in suitable bearings 25 formed in the sides of the casing. A pair of centrifugal hammers 26 are pivoted at the inner ends on pins 27 disposed eccentrically on the disk 22 and at diametrically opposite points thereon outside of the shaft 24. Each hammer is of sufficient length to extend beyond the peripheral edge of the disk and is terminally equipped with a removable head 28 which preferably is screw-threaded onto the hammer, as shown at 29, and extends laterally at a right angle to the axis of the hammer. Pivotal movement of each hammer is directed and limited by a corresponding arcuate guide rod 30 terminally secured to the face of the disk, as shown at 31, and offset between the ter-

minals, as best shown in Fig. 2, to slidably engage in an opening 32 formed in the hammer. A helical spring 33 surrounds each guide between the inner secured end of the guide and the rear edge of the hammer and returns the hammer to its forward limit of pivotal movement after it slides off of the hereinafter described driver at the completion of each blow. Each guide rod 30 is arcuate in outline, the radius of curvature being struck from the pivot pin 27 of the corresponding hammer 26. During rotation of the disk 22 in the direction of the arrowhead, shown in Fig. 1, the hammers will alternately strike the driver and slide off of the driver after the blow against the tension of the controlling spring 33.

The rotary disk 22 is power-driven by the motor 19 and, for this purpose, the stub shaft 24 is equipped with a worm pinion 34 which meshes with a reversible worm 35 which is loose on a shaft 36 that extends longitudinally of the casing and which is journaled in suitable bearings 37 carried by the casing. Meshing gears 38 and 39 connect the shaft 36 with the motor shaft 40.

In order that the hammer operating shaft 36 may be connected and disconnected from the power, the loose reversible worm 35 is equipped with clutch teeth 41, as best shown in Fig. 7, which are adapted to mesh with corresponding clutch teeth 42 formed on a sleeve 43 which is splined, as shown at 44, on the shaft 36. The sleeve is grooved, as shown at 45, to receive the forked end of a shipper 46 which is pivoted, as shown at 47, on a suitable support 48 carried by the casing. An operating rod 49 is connected to the shipper and passes through an opening 50 in the grip where it terminates in a ring 51.

When the rod 49 is pulled rearwardly, the shipper will slide the sleeve 43 and cause the clutch teeth 42 thereof to mesh with the corresponding clutch teeth 41 of the worm and lock the worm for rotation as a unit with the shaft 36, whereupon the disk 22 is power-driven to cause the centrifugal hammers to deliver rapid blows against the driver. When the rod 49 is shoved forwardly, the reverse movement of the clutch members will take place, whereupon the disk 22 is freed from the power and may be returned to initial position by the driver spring, hereinafter described, to begin a new cycle.

The driver 52 is tubular and terminates at the rear end in a hollow head 53 which preferably is rectangular in contour to be slidably and non-rotatably received in the driver guide tube 54. The rear face of the head is beveled to slope obliquely downwardly and forwardly, as shown at 55, and a wear plate 56, of any preferred material, is secured upon said rear face and provides a striking surface for the hammer to impinge against with minimum wear. The wear plate is preferably removably secured to accommodate replacement and, for this purpose, the plate is provided with a stem 57 through which and the head a pin 58 is passed. The head is provided with a lug 59 at the bottom which projects through a longitudinal guide slot 60 in the guide tube, which slot also receives the heads 28 of the hammers and directs movement of the latter so that firm true blows are struck against the head of the driver. The head is also provided at the top with a lug 61 which projects through a longitudinal guide slot 62 formed in the top of the guide tube.

The guide tube 60 is secured to a suitable support 63 carried by the casing and is closed at the rear end by a plug 64. The front end of the guide tube is provided with a boss 65 and a set screw 66 is passed through the casing 10 and into the boss to attach the front of the guide tube to the casing. The front end of the guide tube is also provided with an integral reduced extension 67 through which the leading end of the driver plays during the nailing operation. A suitable oil port 68 is provided to permit oiling of the driver.

A helical spring 69 is connected to the above-mentioned lug 61 on the driver and returns the driver to starting position after each operation. Retrograde movement of the driver is limited by means of a stop pin 70 which projects through the wall of the guide tube.

The combined feed cylinder and magazine 17 is keyed to an axial shaft 71 which projects at both ends through the housing 16. A circular series of open end pockets 72 is concentrically disposed in the feed cylinder, these pockets being of sufficient length to receive nails of various sizes. The diameter of the cylinder is such as to cause the pockets to register in succession with the reduced extension 67 of the driver guide tube, as best shown in Fig. 1, when the shaft 71 is rotated. The feed cylinder is loaded through an opening 73 formed in the front end wall of the housing, which opening is normally closed by a removable plug 74. Manual rotation for loading is effected by means of a knob 75 which is fixed to the front projecting end of the shaft 71.

For imparting a step rotation of the cylinder to feed the nails to the driver, the rear projecting end of the shaft 71 is equipped with a ratchet wheel 76, best shown in Fig. 5. A spring pressed pawl 77 holds the ratchet against retrograde movement. A manually operated pawl 78 engages the ratchet and is equipped with a stand rod 79 which is mounted for vertical movement in suitable guides 80 carried by the casing. A connecting rod 81 is operatively connected to the lower end of the stand rod 79 by means of a link 82 pivoted centrally, as shown at 83, on a sup-

port 84 carried by the casing. The rod 81 extends longitudinally along the casing and below the motor housing 18 and is terminally equipped with a lever 85 which is pivoted, as shown at 86, on a support 87 carried by the grip 11. A spring 88 is interposed between the grip and free end of the lever. When the spring pressed end of the lever is moved forwardly, the connecting rod 81 and stand rod 79 are shifted to move the pawl 78 and advance the feed cylinder one step to position a nail in front of the driver.

By again referring to Fig. 1, it will be seen that a tubular nail guide 89 is axially located in the barrel 15 by means of a threaded nipple 90 which passes through an opening in the barrel and is secured in place by a nut 91. Within the flared bore of the nail guide are disposed preferably four arcuate leaf springs 92 which receive between them the nail 93 ejected from the feed cylinder by the driver, and guide the nail truly during the early stages of the driving operation.

By now referring more specially to Fig. 6, it will be observed that the tubular driver 52 receives in its bore a cylindrical nail setter 94. The nail setter projects into the hollow interior of the driver head 53. A plunger 95 is slidably fitted in an opening 96 formed in the front wall of the head and also projects into the hollow interior of the head. A link 97 is centrally pivoted, as shown at 98, on a suitable support 99 disposed within the hollow interior of the head, both ends of the link being forked and receiving pins 100 and 101 carried by the nail setter and plunger respectively. A helical spring 102 surrounds the plunger exteriorly of the driver head and returns the nail setter to released position after each actuation.

The operation of the nail setter is best shown in Fig. 2, in which it will be observed that at the end of the travel of the driver forwardly, the plunger 95 impinges against the front wall 103 of the driver guide tube whereupon the plunger is driven rearwardly and rocks the link 97 to force the nail setter 94 forwardly to extend beyond the driver and counter-sink the nail. When the clutch sleeve 43 is disengaged to disconnect the power from the hammer disk 22, the driver is immediately returned to released position by its controlling spring 69, and during the initial stages of such return, the controlling spring 102 of the plunger returns the plunger to released position and withdraws the nail setter 94 into the bore of the driver.

In operation, assume that the feed cylinder is loaded and that one of the pockets thereof is in position to aline a nail with the driver, as shown in Fig. 1. The switch 21 is closed by pressure of the operator's fingers to start the motor. The tool is then pointed at the spot where the nail is to be driven and the ring 51 is pulled rearwardly to throw on the clutch and rotate the disk 22. The centrifugal hammers alternately strike the driver and, as each has imparted its momentum to the driver, the hammer slides off from the driver head against the tension of its controlling spring 33. By successive rapid blows of the centrifugal hammers, the driver ejects the nail from the feed cylinder through the nail guide and hammers the nail home. At the limit of movement of the driver, the plunger 96 actuates the nail setter to countersink the nail whereupon the clutch controlling rod 49 may be shoved forwardly to disconnect the power. When the power is disconnected, the driver controlling spring 69 immediately withdraws the driver and positions the same against the stop 70 at its rear limit of movement. During such retrograde movement of the driver, if one of the hammers is still in contact with the driver head, as shown in Fig. 2, the disk 22 will be rotated in a counter-clockwise direction, the loose worm 35 permitting of such movement, and will come to rest in position to begin a new cycle.

From the above description, it is thought that the construction and operation of my invention will be clearly understood without further description.

Having thus described the invention, I claim:

1. A portable nailing machine including a hollow driver, a nail setter in the driver, a driver guide tube, means coacting with the guide tube for extending the nail setter from the bore of the driver at the forward limit of movement of the driver, a nail feed cylinder in advance of the driver, and power-driven centrifugal hammers adapted to enter said guide tube and deliver blows against the driver.

2. A portable nailing machine including a driver, a guide tube slidably and non-rotatably receiving the driver, said guide tube having longitudinal slots, a lug on the driver projecting through one of said slots, a spring connected to said lug exteriorly of the tube for returning the driver to starting position after each nailing operation, a nail feed cylinder in advance of the driver, centrifugal power-driven hammers adapted to enter the other of said slots and deliver blows against said driver, and a clutch for disconnecting said hammers from the power whereby said spring may return the hammers to starting position simultaneously with the return of the driver to starting position.

3. A portable nailing machine including a driver, a nail feed cylinder in advance of the driver, a motor, a rotary disk, a shaft geared to said motor, a loose worm on said shaft, a worm pinion meshing with the worm for driving the disk, a clutch sleeve on the shaft adapted to lock the worm for rotation as a unit with the shaft, a spring for returning

said driver to starting position after each nailing operation, centrifugal hammers carried by said disk for delivering successive blows against the driver, and means for throwing off said clutch whereby said spring may rotate said disk and loose worm in a retrograde direction to starting position simultaneously with return of the driver to starting position.

4. A portable nailing machine including a driver, a nail feed cylinder in advance of the driver, a power-driven disk, centrifugal hammers pivoted eccentrically on the disk, arcuate guide rods for limiting and directing pivotal movement of the hammers on the disk, and a spring on each guide rod for holding the respective hammer yieldably at the forward limit of its pivotal movement, said hammers being adapted to alternately deliver blows against said driver and ride off of the driver against the tension of said springs after each blow.

5. A portable nailing machine including a tubular driver, a nail feed cylinder in advance of the driver, a nail guide in advance of said feed cylinder, said driver being adapted to play through said feed cylinder and through said nail guide during the nailing operation, a nail setter carried in the bore of said driver, means for extending said nail setter in advance of said driver at the forward limit of movement of the driver, means for withdrawing said nail setter in the bore of said driver during retrograde movement of the driver to starting position, a spring for returning said driver to starting position, and centrifugal power-driven hammers adapted to deliver blows against the driver.

6. A portable nailing machine including a driver, a nail feed cylinder in advance of the driver, a rotary disk below the driver, a power-driven shaft, a loose worm on said shaft, a worm pinion carried by the disk and meshing with said worm, a clutch sleeve splined on said shaft and adapted to lock said worm for rotation as a unit with the shaft, a shipper for disengaging said clutch sleeve to permit the worm to idle on the shaft, centrifugal hammers carried by the disk and adapted to deliver blows against the driver, a spring for returning said driver to starting position after each nailing operation, and means for actuating the shipper to disengage the clutch and permit said spring to rotate said disk through the instrumentality of said hammers and return the disk to starting position simultaneously with the return of the driver to starting position.

In testimony whereof I affix my signature.

WALTER A. DAY. [L. S.]