May 31, 1955 W. N. HENRY 2,709,570

PNEUMATIC NAIL PULLER

Filed July 31, 1953 2 Sheets-Sheet 1

Fig 1

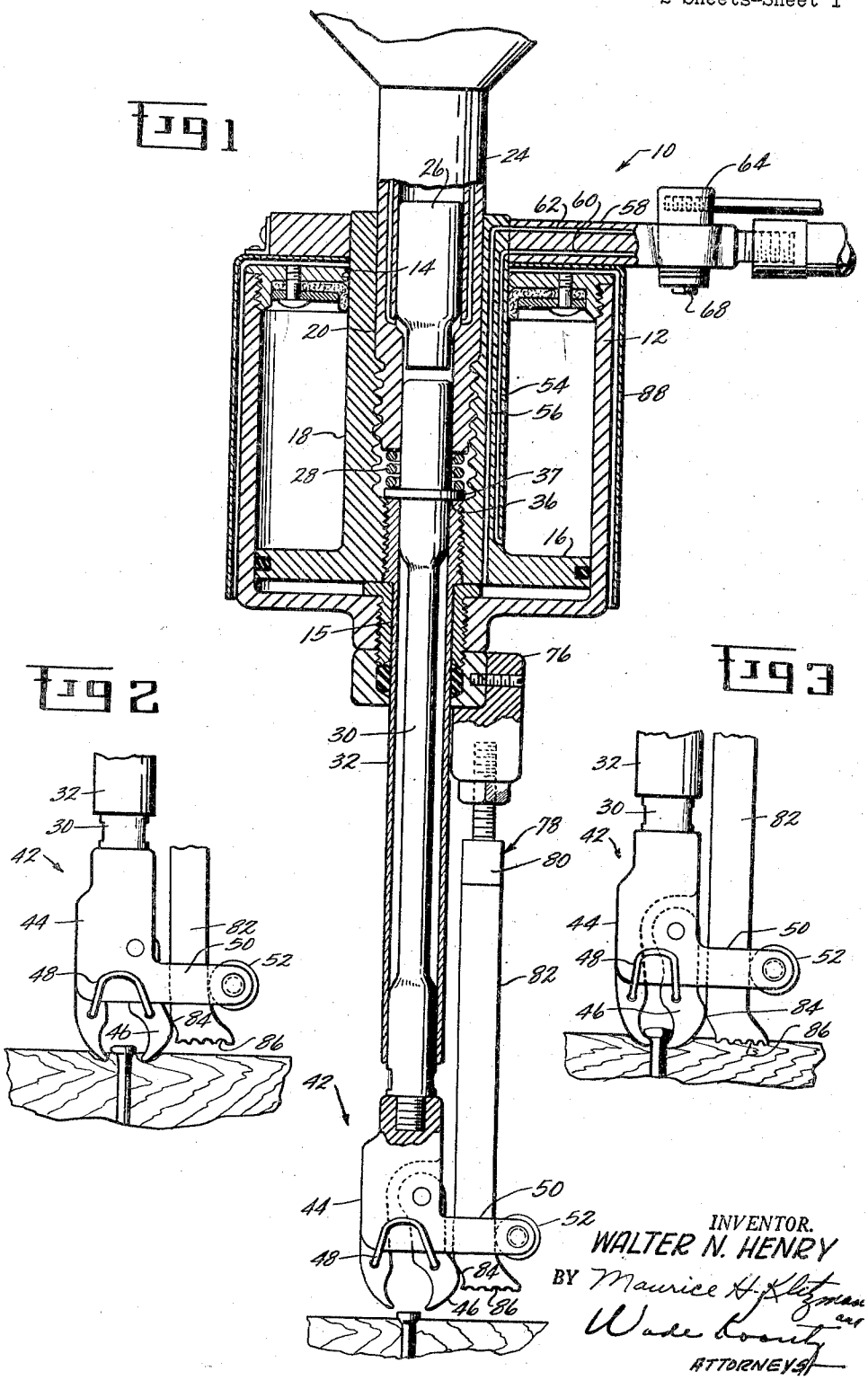


Fig 2

Fig 3

INVENTOR.
WALTER N. HENRY
BY Maurice H. Klitzman and Wade Conely
ATTORNEYS

May 31, 1955 W. N. HENRY 2,709,570

PNEUMATIC NAIL PULLER

Filed July 31, 1953

2 Sheets-Sheet 2

Fig 4

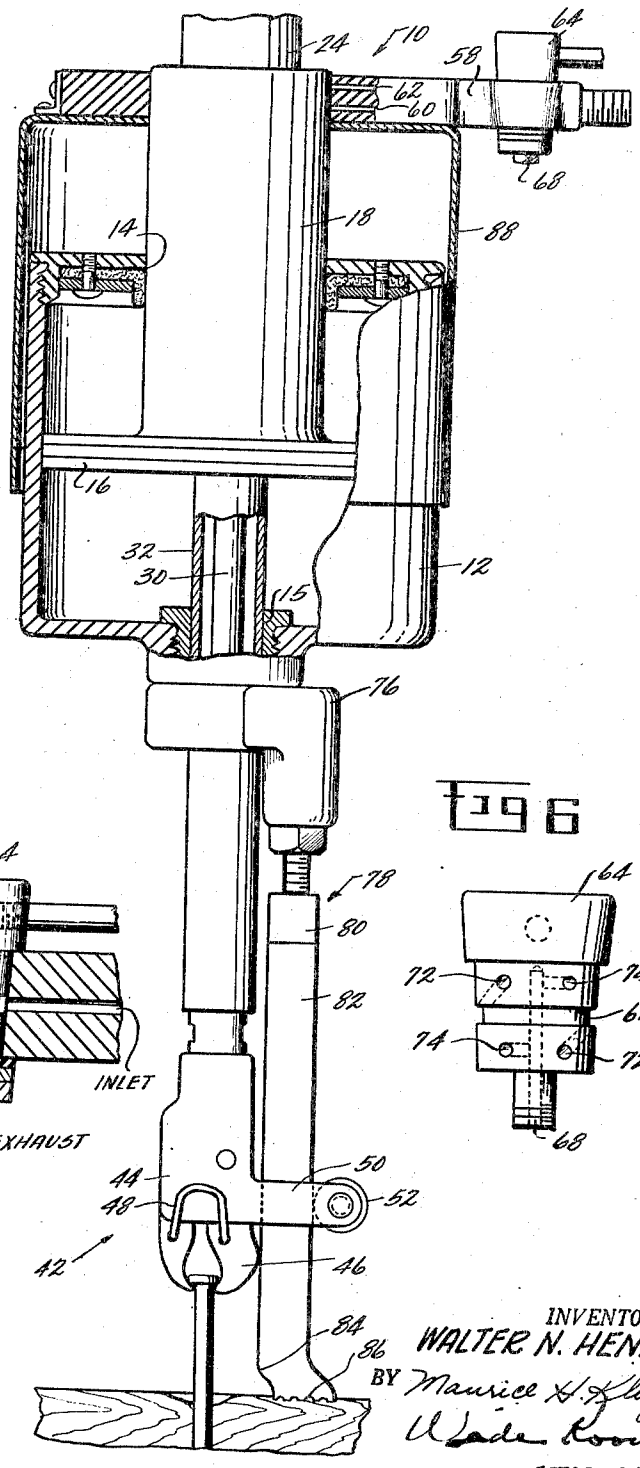


Fig 5

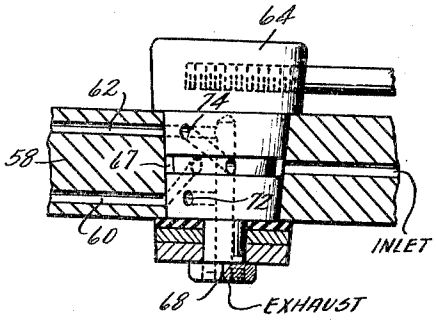


Fig 6

INVENTOR.
WALTER N. HENRY
BY Maurice H. Klitzman and Wade Roont
ATTORNEYS

United States Patent Office 2,709,570
Patented May 31, 1955

2,709,570

PNEUMATIC NAIL PULLER

Walter N. Henry, Addison, Ohio

Application July 31, 1953, Serial No. 371,747

5 Claims. (Cl. 254—18)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to a nail puller, and in particular, one that is pneumatically operated.

In extracting nails, it is difficult to pull them out in such a manner so that the nail will be straight and adapted to be reused. It is, therefore, an object of this invention to provide a nail puller which may extract nails from wood in a straight condition so that they may be reused.

It is another object of this invention to eliminate all muscular effort apparently necessary in the removal of nails from wood.

It is a still further object of this invention to provide a nail puller which is adapted to extract nails by first injecting a pair of claws into the wood surrounding the nail and then by a separate pneumatic means closing the claws so as to engage the nail and ejecting the nail therefrom in a straight and outwardly manner.

It is a still further object of this invention to provide a piston, piston rod and cylinder arrangement having an air hammer attached to one end of the piston rod which is adapted to actuate upon a shaft also mounted on the piston rod. The shaft is further provided with a pair of claws adapted to penetrate the wood when the air hammer actuates against the shaft. The cylinder is provided with an elongated plunger mounted adjacent to the claws. The plunger is provided with a cam which is adapted to engage one of the claws so that upon the piston being moved upwardly and the cylinder downwardly the plunger will engage one of the claws so that the claw will move inwardly and grip the nail. A continuation of the upward movement of the piston will provide an action whereby the claws and shaft will move outwardly from the wood thereby extracting the nail.

These and other objects will become more apparent when read in the light of the accompanying drawings and specification wherein:

Fig. 1 is a cross-section view broken in sections showing the arrangement of the parts;

Fig. 2 is a view showing the claws penetrating the wood;

Fig. 3 is a view showing the claws gripping the nail;

Fig. 4 is a view partially in cross-section showing the nail being extracted;

Fig. 5 is a side view of the control valve showing the position of the passageways with respect to the control valve body;

Fig. 6 is a front view of the control valve showing the passageways therein.

Referring to the drawings, the numeral 10 generally designates a nail puller provided with a cylinder 12. This cylinder is provided with opening 14 at the top thereof and opening 15 at the bottom. A piston 16 is slidably mounted in the cylinder and is provided with a piston rod 18 extending through the opening 14 of the cylinder. The piston rod 18 is provided with an opening 20 extending longitudinally of the piston and piston rod. The opening 20 is provided with internal threads at one end of the longitudinal opening. An air hammer 24 extends into the longitudinal opening threadably engaging the piston rod. An air hammer plunger 26 is floatably mounted in the air hammer. Adjacent the end of the air hammer 24 is mounted a spring 28. A shaft 30 extends through the opening 15 of the cylinder and the longitudinal opening 20 in the piston and piston rod and is held in place by a sleeve 32 threadably mounted in the end of the longitudinal opening 20. The sleeve 32 provides an abutment 36 for limting the movement of the piston rod 18 by engaging the enlarged portion 37 on the shaft 30. The shaft 30 is threaded at its end so as to receive the nail pulling jaws generally designated as 42. The jaws hold a stationary jaw 44 which is threadably mounted on the shaft and a pivotally mounted jaw 46 which is pivoted on the stationary jaw 44. A jaw opening spring 48 is mounted between the stationary jaw and the pivotally mounted jaw so as to normally retain them in open position. The stationary jaw 44 is provided with a bracket in the shape of a yoke 50 having a roller 52 rotatably mounted at the end of the yoke and extending transversely thereof. A passageway 54 in the piston rod 18 extends from the top of the piston rod to a position immediately above the piston 16. A passageway 56 extends from the top of the piston rod to a position below the piston 16. The control valve body 58 is fastened to the piston rod 18 and is provided with openings 60 and 62 to communicate with the passageways 54 and 56 respectively. A control valve 64 extends through the body 58 and is further provided with a handle thereon. The control valve is provided with an exhaust opening 68 and a circumferential groove 67. The exhaust opening is in communication with the atmosphere and the circular groove is in communication with an air inlet. The control valve is further provided with openings 72 which are connected to the circular groove and are adapted to register with the openings 56 and 54. Openings 74 in the control valve extend to the exhaust opening 68 and register with the passageways 56 and 58. One of the openings 72 and one of the openings 74 are adapted to register with the openings 60 and 62 at any one time. A bracket 76 is attached to the cylinder 12 at the opening 15. A plunger 78 is threadably mounted in the bracket 76 and is constructed so as to have a circular cross-section 80 and a rectangular cross-section 82 and a cam portion 84. The end of the extracting plunger is provided with a plunger foot 86 adapted to engage the surface from which the nail is going to be pulled. A cup shaped sleeve 88 is fastened to control valve body 58 and surrounds the cylinder 12. The sleeve therefore moves with the piston rod so that no space exists between the control valve body 58 and cylinder 12. This sleeve prevents the operator from accidentally suffering crushed fingers when the mechanism is returned to air hammering position.

In operation the nail pulling jaws are in an extended position so that they may be applied to the surface of the wood about the nail. When the operator positions the claws or jaws about the nail head to be removed and applies a slight pressure against the nail puller 10, the shaft 30 will be pressed inward against the spring 28 toward the air hammer plunger 26 to a position where it can be struck by the hammer plunger. When the shaft and the air hammer plunger are in this position the operator may actuate the air hammer (which is not shown) causing the air hammer plunger to strike the upper end of the shaft. This results in the jaws being driven into the wood about the nail as shown in Figure 2. When the jaws have been driven in sufficiently to enable them to grip the head of the nail, the operator releases the hammer throttle (not shown) so as to cease the striking operation.

During the time the hammering operation is being carried out, the control valve 64 was in such a position as to admit air to the upper end of the cylinder and to exhaust the lower part of the cylinder to the atmosphere through the passageways 56, 62 and 74 to the exhaust in the control valve. The air under pressure to the upper part of the cylinder is admitted through the air inlet and passageways 72, 60 and 54. The control valve lever is now thrown to its secondary position which will exhaust the upper portion of said cylinder through passageways 54, 60 and 74, and admit air under pressure to the lower part of the cylinder through passageways 72, 62 and 56. This position of the control valve will result in the cylinder and plunger first being forced downwardly parallel to the axis of the piston rod in the direction of the wood. During the time that the plunger 82 is approaching the wood the cam 84 in conjunction with the roller 52 will force the movable jaw toward the stationary jaw 44 resulting in their closing over the head of the nail. At this point the axial movement of the cylinder 12 and the plunger 82 attached thereto will be brought to a stop by the foot 86 of the plunger engaging the wood. The piston 16 carrying with it the piston rod 18 and shaft 30 with the jaws at its extremity will take up the motion imparted by the compressed air being admitted to the lower part of the cylinder. As the piston 16 the shaft 30 and rod 18 continue in their upward motion the nail will be carried outwardly by the jaws until the piston reaches the top of its stroke and the nail has been extracted far enough to clear the wood.

In order to release the nail, the control valve 64 is returned to its original position so that the opening 74 in the control valve will register with the passageway 56 in the piston rod so as to exhaust the underside of the cylinder and admit air under pressure to the upper part of the cylinder through the opening 72 in the control valve and the passageway 54 in the piston rod. The force of the air under pressure will return the piston to its original position permitting the jaws to open by the action of the spring 48 thereby releasing the nail.

It is, therefore, seen that a device has been provided which greatly increases the speed of opening and inspecting the contents of nailed wood cartons where it involves the removal of nails therefrom.

Although the specific apparatus embodying this invention has been shown and described, it will be understood that such a showing has been made in order that the invention may be more completely understood, such a showing is not to be considered as in any way limiting this invention. Many other types of apparatus may be used to carry out this invention as well as many modifications, additions and omissions from the particular apparatus shown and described which are to be included within the spirit and intent of this invention.

What is claimed is:

1. A pneumatic nail puller for pulling nails from wood comprising in combination a cylinder, a piston slidably mounted in said cylinder, piston rods extending from both sides of said piston outwardly through both ends of said cylinder, an air hammer axially mounted in one end of one of said piston rods, a shaft provided with gripping jaws mounted in the one end of the other of said piston rods, said cylinder being provided with an extracting plunger, cam means on said extracting plunger, spring means urging said jaws outwardly to engage said cam means, control valve means for controlling the movement of said piston in said cylinder, an air hammer plunger

adapted to strike said shaft to force said jaws to penetrate the wood surrounding said nail, said control valve being positioned so that upon engagement of said jaws with said nail said cylinder moves relatively downwardly away from said piston when air is applied in the bottom of the cylinder thereby urging said extracting plunger toward said wood, said cam means actuating said jaws inwardly to grip said nail, and said extracting plunger engaging said wood, further movement of said piston and cylinder resulting in said shaft and jaws extracting said nail from said wood, and means for releasing said nail from said jaws.

2. A pneumatic nail puller for extracting nails from wood comprising in combination a cylinder, a piston slidably mounted in said cylinder, a piston rod extending from said piston outwardly through said cylinder, said piston rod having a longitudinal opening extending therethrough, an air hammer plunger axially mounted in said longitudinal opening, a shaft slidably mounted in said longitudinal opening adjacent to said plunger, said shaft being spring biased away from said air hammer, nail gripping jaws at the end of said shaft, upon pressure being exerted on said air hammer said shaft being adapted to move toward said air hammer plunger, said air hammer plunger being adapted to strike said shaft so as to permit said jaws to penetrate the wood surrounding said nail, said cylinder provided with an extracting plunger, means on said extracting plunger adapted to urge said jaws inwardly, spring means for urging said jaws outwardly, means for exhausting the cylinder above said piston and furnishing compressed air to said cylinder below said piston so that said means on said extracting plunger will urge said jaws inwardly to grip said nail, and said extracting plunger will engage said wood so that further movement of said piston will extract said nail from said wood.

3. A pneumatic nail puller for extracting nails from wood as in claim 2 wherein the means for exhausting the cylinder above said piston comprises longitudinal passageways provided in said piston rod, one of said passageways terminating above said piston, and one of said passageways terminating below said piston, and includes a control valve adapted to register one of said passageways with an exhaust while the other is open to a source of compressed air.

4. A pneumatic nail puller for extracting nails from wood as in claim 2 wherein a cover is provided for surrounding said cylinder, said cover being mounted for movement with said piston rod.

5. A pneumatic nail puller for extracting nails comprising a piston and cylinder, a piston rod extending through said cylinder, a control valve for operating said piston and cylinder mounted on said piston rod, said control valve adapted to move with respect to said cylinder to leave a space therebetween, a protective cover mounted on said control valve to surround the exterior of the cylinder and move with said piston rod and to cover said space so that said space is not accessible, and means connected to said piston for engaging said nail adapted to cooperate with means on said cylinder for removing said nail.

References Cited in the file of this patent

UNITED STATES PATENTS

222,112	Wilson	Nov. 25, 1879
1,219,334	Lower	Mar. 13, 1917
2,570,914	Buck	Oct. 9, 1951
2,635,585	Damgaard	Apr. 21, 1953
2,663,339	Verderber	Dec. 22, 1953