Aug. 19, 1969 N. J. JOHNSON 3,461,588

EXPLOSIVELY OPERATED INJECTION GUN FOR TREATING TREES

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FIG. 1.

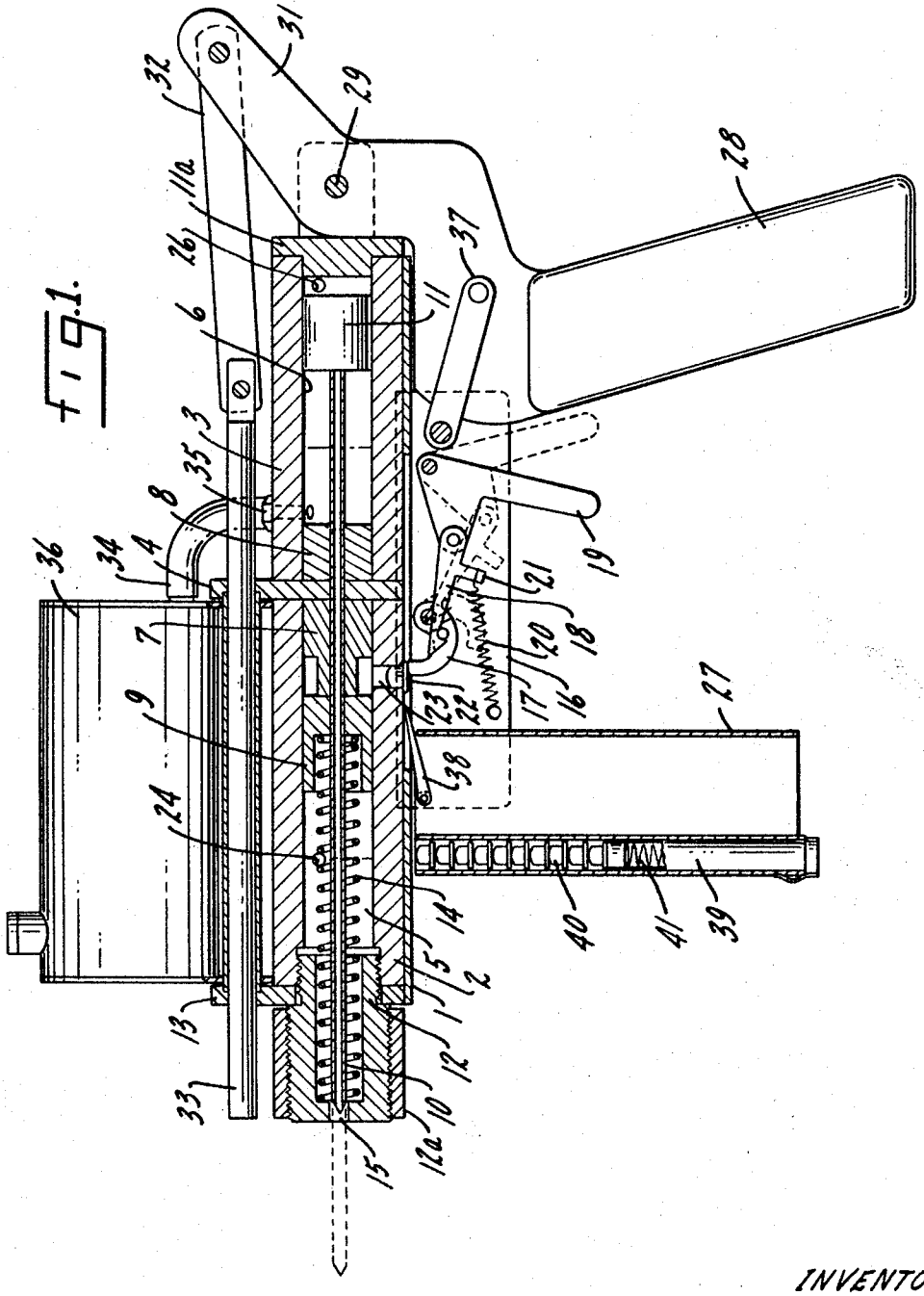

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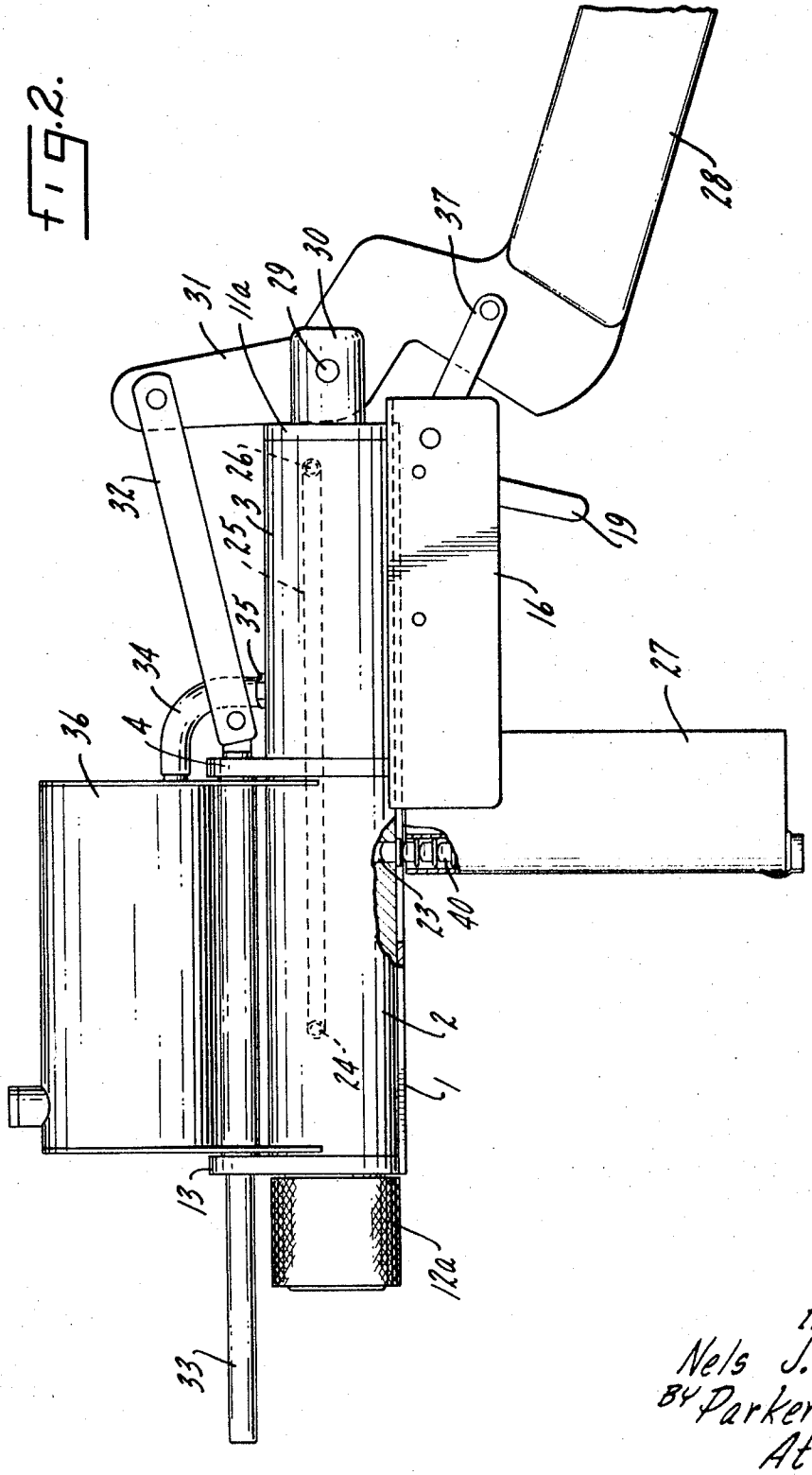
Fig. 2.



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EXPLOSIVELY OPERATED INJECTION GUN FOR TREATING TREES

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U.S. Cl. 42—1 6 Claims

ABSTRACT OF THE DISCLOSURE

A hand gun using an explosive cartridge for injecting systemic fungicides, pesticides, antibiotics, and other chemicals into trees. The gun is held against the tree, a trigger is pulled, a cartridge fires in a chamber to generate pressure enough to force a needle through the bark into the tree, gas pressure then forces a liquid through the needle into the tree. A plunger is then pulled back by hand to withdraw the needle from the tree, eject the fired cartridge and reload the gun with a new cartridge and a measured supply of liquid.

SUMMARY OF THE INVENTION

The apparatus includes a frame, a barrel therein, a firing chamber in the barrel, a slide, a magazine, an extractor finger, a firing mechanism and a trigger carried by the slide, a loading lever or handle pivoted on the frame, a driving connection between the lever and the slide such that rotation of the lever moves the slide to extract a spent cartridge from and insert a fresh cartridge in the chamber and place the trigger in reach of the finger of the user as it holds the handle. The barrel contains aligned separate power and injection cylinders. A power and injection piston in each, an injection needle carried by the power piston, the firing chamber being open to the power cylinder behind the power piston, means for adjusting the outward excursion of the power piston and needle in response to the pressure generated by firing the cartridge, the needle being open to the injection cylinder after it has been forced into the tree. A pressure duct between the injection cylinder behind the injection piston and the power cylinder open only after the power piston has reached the forward end of its excursion responsive to the pressure generated by the fired cartridge, the injection piston being free to move forwardly responsive to the pressure behind it to inject a measured supply of liquid through the needle into the tree. An extractor plunger slidable on the frame. A driving connection between it and the loading lever such that rotation of the lever also urges the plunger forwardly against the trees to force the gun away from the tree and extact the needle therefrom. A spring biasing the power piston and the injection piston back to the starting position when the needle has been withdrawn from the tree. A reservoir mounted on the frame, a duct between the reservoir and the injection cylinder in front of the injection piston. A check valve therein so disposed that movement of the injection piston to the rear under the influence of the spring draws a measured supply of fluid from the reservoir into the injection cylinder in front of the injection piston.

BRIEF DESCRIPTION OF THE DRAWINGS

Referring to the drawings:

FIGURE 1 is a diagrammatic view, part in side elevation and part in section showing the injection gun just before discharge;

FIGURE 2 is a similar view disclosing the loading arm or handle in the reloading position.

Like parts are indicated by like numerals throughout the specification and drawings.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The base plate **1** has attached to it a power barrel **2**, an injection barrel **3** in alignment and separated by a perforate separation plate **4** which closes the adjacent ends of the barrels **2** and **3**. The power barrel contains a power cylinder **5**. The injection barrel contains an injection cylinder **6**. Cushion members **7** and **8** respectively are in the power and injection barrels against the plate **4**. The power cylinder contains a power piston **9** which carries the injection needle **10**. The injection needle **10** extends rearwardly through the cushions **7**, **8** and the plate **4** and in the starting position abuts against the injection piston **11** slidable in the injection cylinder **6**. The piston **9** rests against the cushion **7** in the starting position and there is clearance behind the piston **11** between it and the barrel closing plug **11***a* at the rear end of the injection cylinder.

The plug **12** is threaded into the barrel **2**, holds the apertured guide plate **13** against the end of the barrel and is also attached to the frame **1**. The plug **12** is hollow and contains a retraction spring **14** compressed between it and the piston **9**. The plug is apertured at **15** to permit the injection needle to come out and carries an adjustment sleeve **12***a* which may be rotated outwardly to limit the penetration of the needle. The forward movement of the piston **9** is positively limited by the plug **12**.

The slide **16** is movable along the base plate or frame **1**. In the starting position as shown in FIGURE 1, the slide carries a pivoted striker **17** connected by a link **18** to the trigger piece **19**. A spring **20** anchored at one end on the slide **16** is anchored at the other end on a lug **21** on the link **18** so that retraction of the trigger piece **19** toward the rear draws the striker **17** back, exerts tension on the spring **20**. Thus a release of the trigger piece **19** allows the striker to rotate and hit the primer on a cartridge **22** in the firing chamber **23** communicating with the power cylinder behind the piston **9** to fire the charge. When that happens pressure is built up behind the piston **9**, forces the needle outwardly through the plug **12** into the tree, compressing the spring **14**. As the piston **9** goes forward, it uncovers the gas port **24** so that pressure passes therethrough through the duct **25** shown in dotted lines on FIGURE 2, to the gas port **26** behind the injection piston **11**. The forward movement of the needle takes it out of contact with the piston **11** and leaves it in the injection cylinder in front of the piston. The piston **11** moves forwardly and forces the liquid in the injection cylinder **6** out through the needle into the tree.

To reload the gun, the operator holds the forward handle **27** which extends downwardly from the slide **16** and rotates the reloading lever or handle **28** rearwardly about its pivot point **29** on the lug **30**. This rotates the disengaging lever **31** in a counterclockwise direction and through the link **32** forces the extractor plunger **33** sliding in **4** and **13** against the tree, thus forcing the gun away from the tree to free the needle so that the spring **14** moves piston **9**, needle **10** and piston **11** back to the starting position.

When this happens a vacuum is drawn in the injection chamber **6** through the duct **34** controlled by the check valve **35** so that liquid is drawn into the injection cylinder **6** in front of the piston **11** from the supply reservoir **36**.

This movement of the handle or reloading lever **28** also because of the linkage **37** draws the slide **16** back, the extractor plate **38** moving with the slide travels along the under side of the barrel **2**, camming the spent cartridge out in the usual manner from the firing chamber

so that the spent cartridge drops out of the slide. Continued movement of the slide brings the magazine 39 in register with the firing chamber 23 so that a new cartridge 40 is by the spring 41 forced into the firing chamber. Return movement of the lever 28 brings the part back to the position shown in FIGURE 1 and the gun is ready for reuse.

The firing mechanism is purely diagrammatic. Firing mechanisms could be used of many other types in this connection. All that is required is that it be a firing mechanism which extracts the spent cartridge, loads the fresh cartridge and makes it possible to fire that cartridge by manipulation of the trigger.

I claim:

1. In combination, a portable injection gun, an injection needle carried thereby, explosive means adapted to force the needle from the gun through the bark and into the wood of a tree, and after the needle has penetrated the tree to force a measured supply of liquid through the needle into the tree.

2. The device of claim 1 characterized by the fact that the gun has a manually operated means for positively withdrawing the needle from the tree and automatic means responsive to the manual means for reseating the needle in the gun, recharging the explosive means in the gun and measuring out a new supply of liquid for the gun.

3. The device of claim 1 characterized by the fact that the gun includes separated, aligned power and injection cylinders, a piston in the power cylinder carrying the needle, the needle open to the injection cylinder, a piston in the injection cylinder, a firing chamber open to the power cylinder behind the piston and adapted to receive an explosive cartridge, a measured supply of injection liquid in the injection cylinder in front of the piston therein, a pressure duct between the power cylinder and the injection cylinder behind the two pistons open, to the pressure side of the power cylinder only after the power piston has forced the needle into the tree, the piston in the injection cylinder being free to move forward and force the liquid from the injection cylinder through the needle into the tree responsive to the pressure through the duct.

4. The device of claim 2 characterized by the fact that a reloading lever is pivoted on the gun, an extractor plunger slidable on the gun is connected to the lever so that rocking of the lever forces the plunger against the tree to force the gun back from and extract the needle from the tree.

5. The device of claim 4 characterized by the fact that a slide on the gun is linked to the loading lever so that rotating of the lever draws the slide rearwardly to extract a fired cartridge from and insert a new cartridge into the firing chamber.

6. The device of claim 3 characterized by the fact that a spring, effective upon withdrawal of the needle from the tree biases the needle and pistons back to the starting position, a reservoir is carried by the gun, a connection between the reservoir and the injection cylinder permits vacuum induction of a supply of liquid from the reservoir into the injection cylinder in front of the piston as the piston returns to the starting position.

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21—73; 47—57.5