

[54] **FUEL STOP MEANS FOR A DIESEL PILE HAMMER**

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**123/46 SC**

[51] **Int. Cl.<sup>2</sup>**..... **E02D 7/12**

[58] **Field of Search** ..... **173/128, 130, 131, 138,**  
**173/137, 135; 123/46 SC, 46 H**

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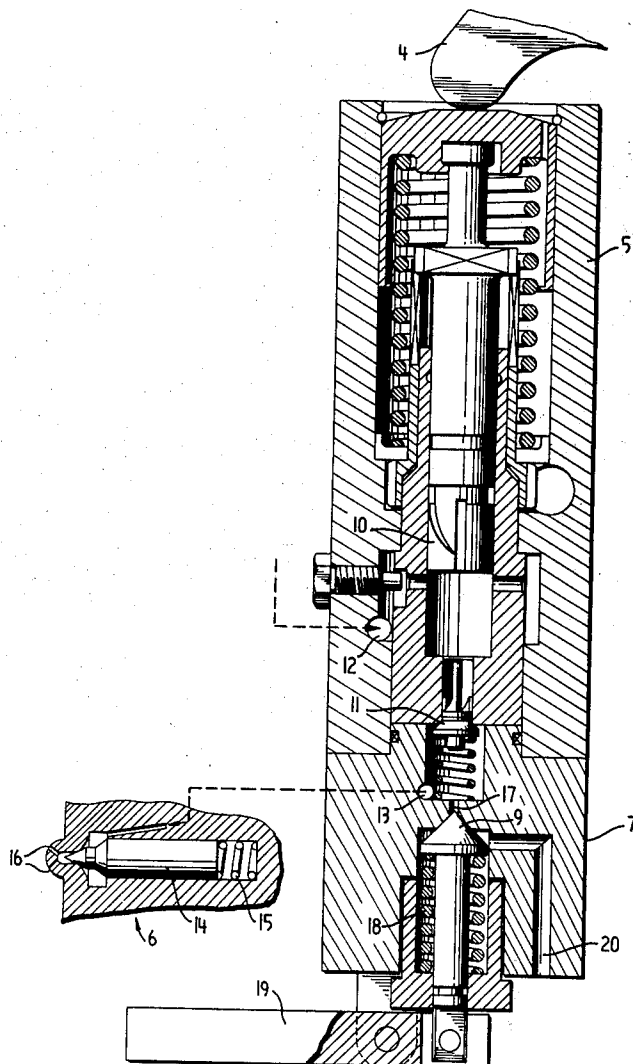
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McClelland & Maier

[57] **ABSTRACT**

A fuel stop means for a diesel pile hammer especially a fuel-stop-means for a diesel pile hammer of the type wherein a fuel pump is driven by a cam mechanism in contact with a ram, wherein the fuel delivered from the fuel pump is injected into a cylinder through a fuel injection valve adapted to open at high pressure. The invention ensures quick stopping of the operation of the diesel pile hammer irrespectively of its operation cycle and improves the safety and efficiency in the work to be done utilizing the diesel pile hammer, whereby the work may be done in a relatively short period of time.

**3 Claims, 4 Drawing Figures**



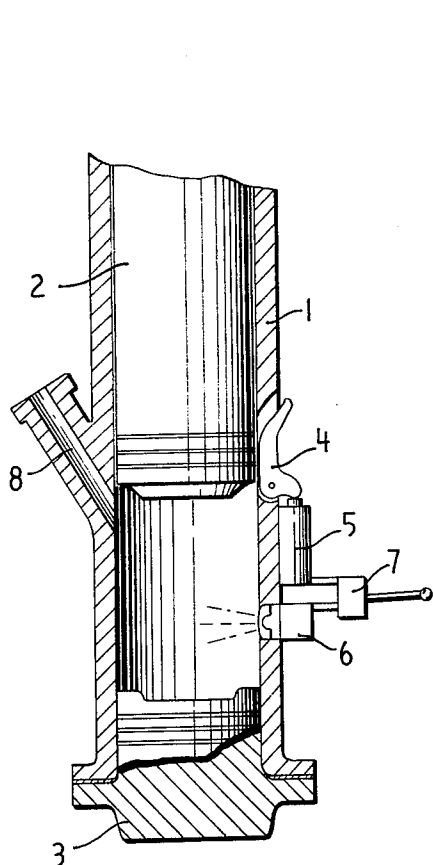


FIG. 1

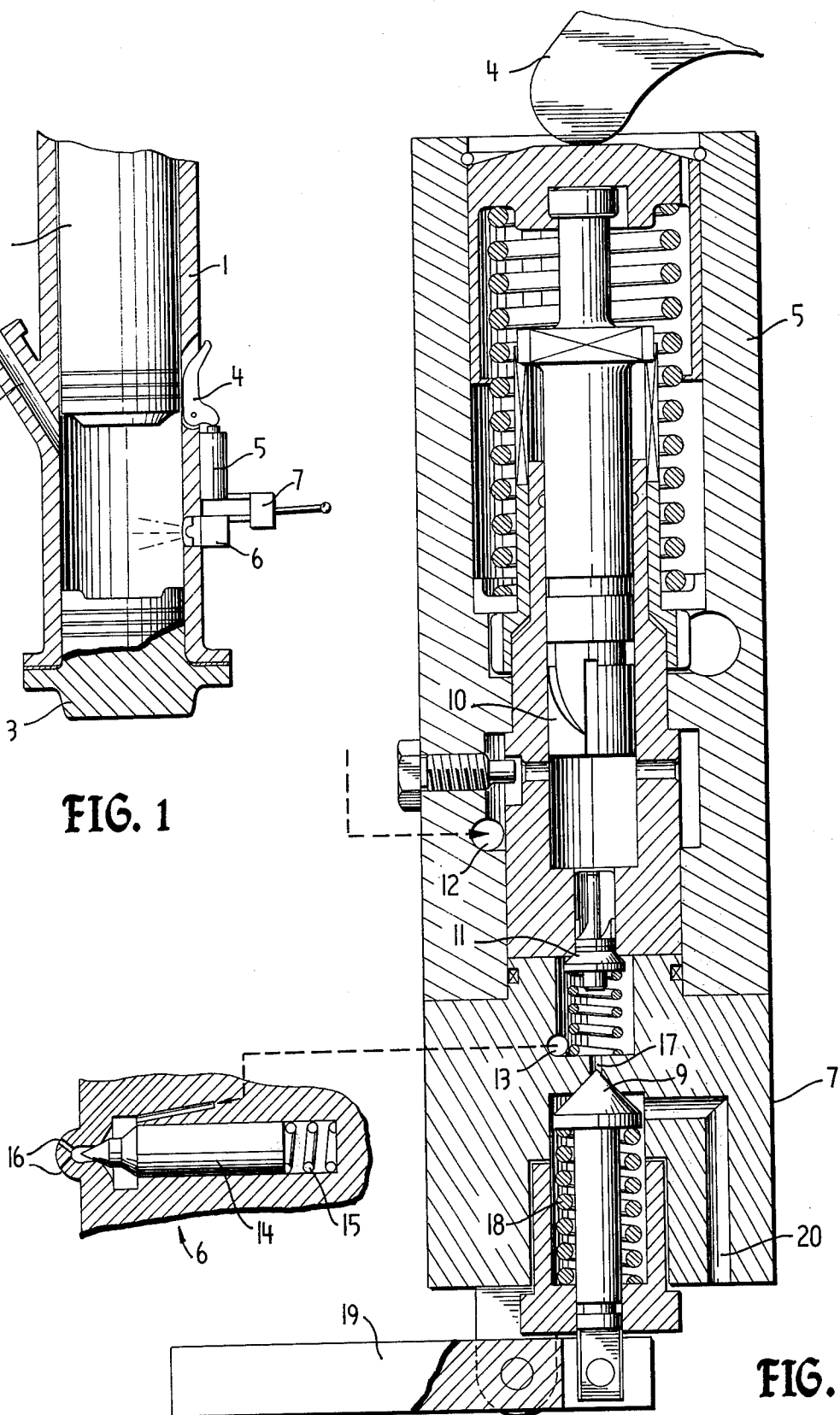


FIG. 2

FIG. 3

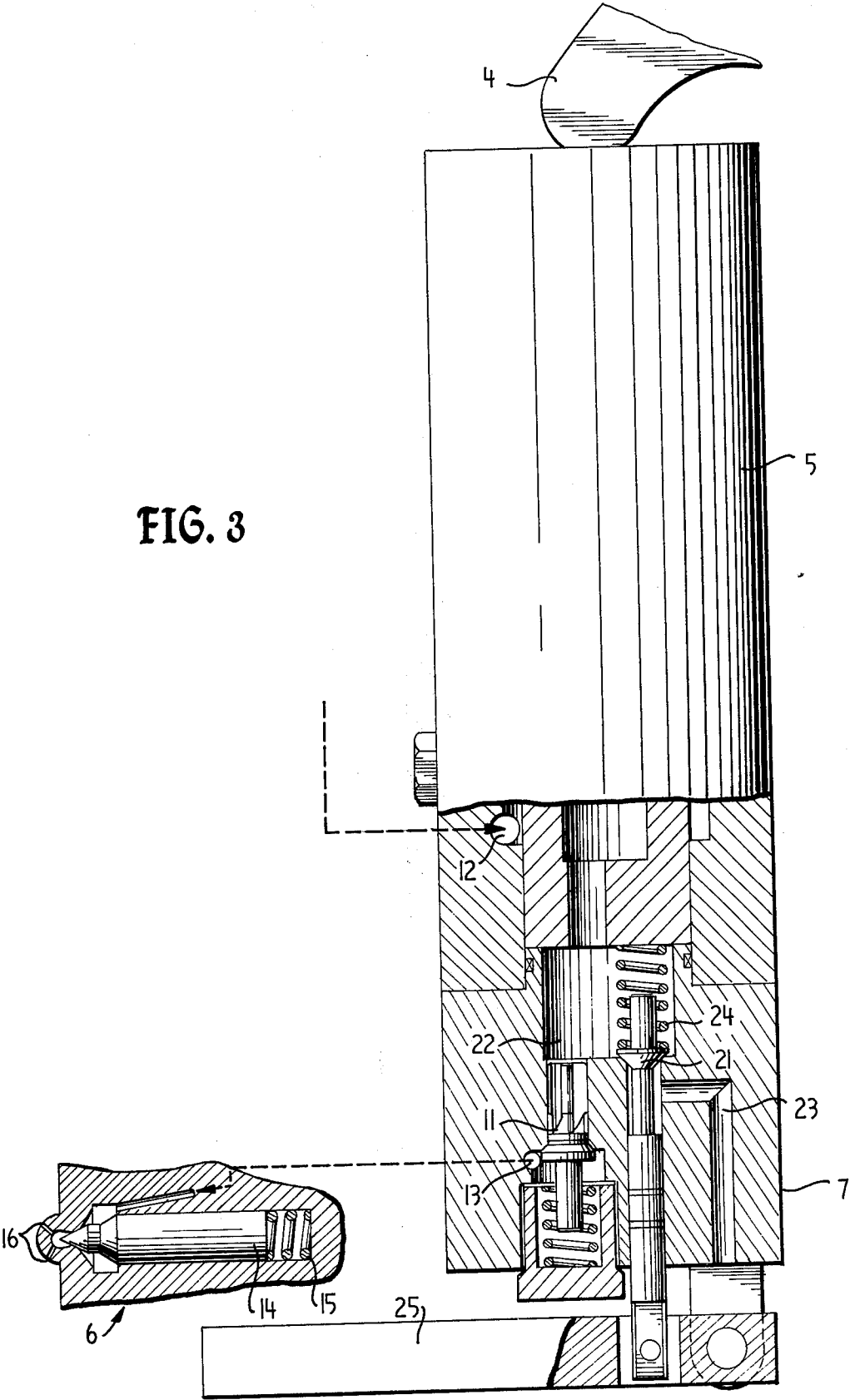
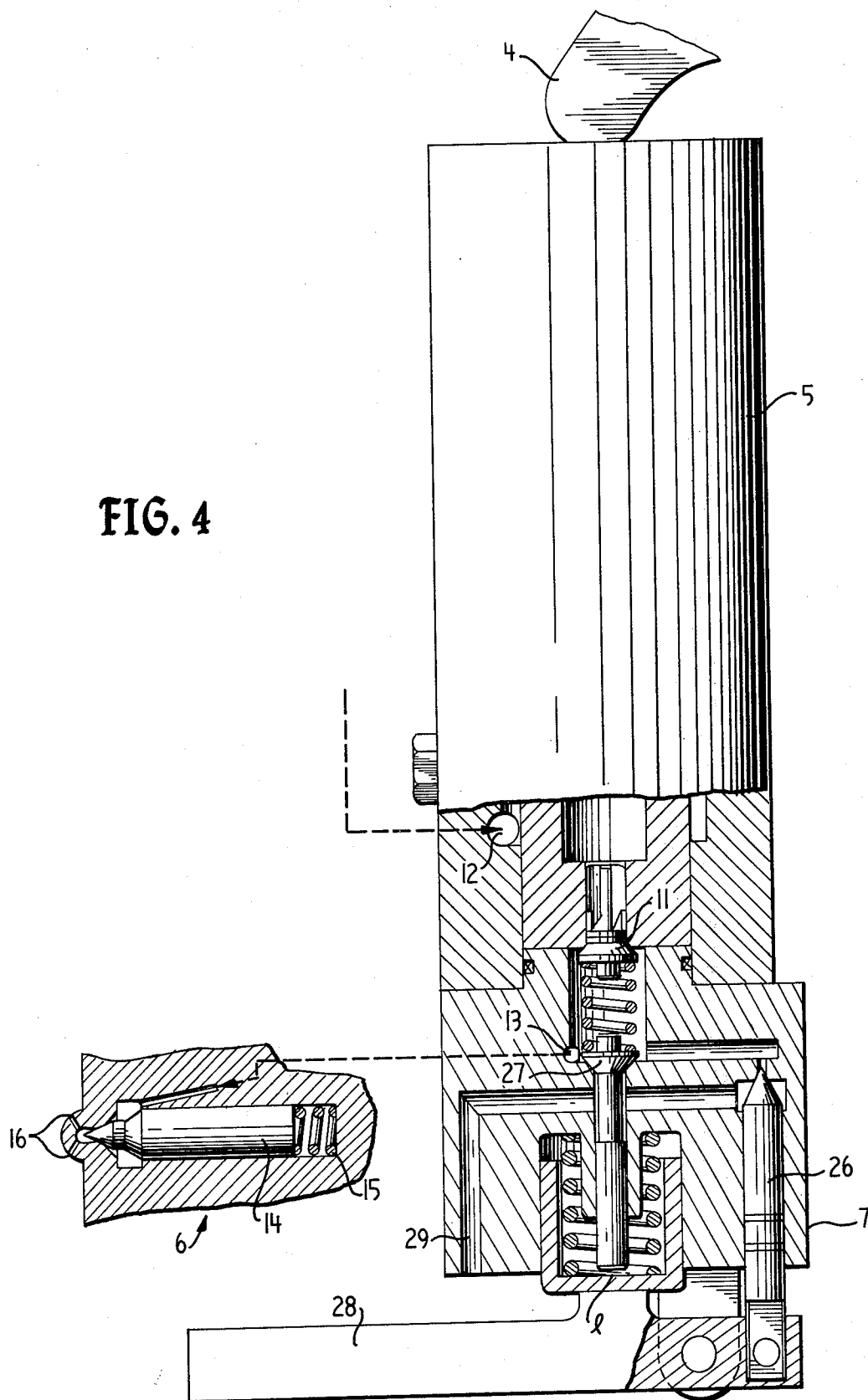


FIG. 4



## FUEL STOP MEANS FOR A DIESEL PILE HAMMER

### BACKGROUND OF THE INVENTION

#### 1. Field of the Invention

The present invention relates to a fuel stop means for a diesel pile hammer and more particularly to a fuel-stop-means for a diesel pile hammer of the type wherein a fuel pump is driven by a cam mechanism in contact with a ram.

#### 2. Description of the Prior Art

In a fuel stop means for a diesel pile hammer of the type wherein the fuel pump is actuated by compressed air in the cylinder, it is known to close the fuel conduit connecting the fuel pump to the injection valve. However, in such fuel pump which makes use of the pressure in the cylinder the required injection pressure cannot be obtained since pressurizing of the fuel is limited. Therefore, it has been proposed that the fuel pump be driven by the cam mechanism making contact with the ram, such that optimum combustion may be obtained. The diesel pile hammer of this type has the advantage that any harmful elements are not retained in the exhaust gases.

On a fuel stop means for a diesel pile hammer utilizing such a cam mechanism, it is problematical to close or block the fuel conduit in the same manner as in the case where compressed air is utilized. In other words, in a fuel pump driven by compressed air, if the fuel conduit to the injection valve of the pump is closed, only the pump is stopped, and any excessive pressure or overstress would never be generated. In a fuel pump driven by a cam mechanism, if the fuel conduit to the injection valve of the pump is closed, excessive pressure will be generated in the pump, and the cam mechanism will also be stopped and locked. In some cases, the cam mechanism and fuel pump will even be destroyed by the force applied from the ram.

### SUMMARY OF THE INVENTION

Accordingly, it is an object of the present invention to provide a new and improved means ensuring quick stopping of a diesel pile hammer.

Another object of the present invention is to provide a means ensuring quick stopping of a diesel pile hammer, in safety, without effecting any excessive pressure and stress by quickly stopping the injection of fuel even in a diesel pile hammer of the type wherein the fuel pump driven by the cam mechanism is provided and fuel is injected into the cylinder through a valve set to open at high pressure above the combustion gas pressure.

A further object of the invention is to provide a manually operated valve for ensuring quick stopping of a diesel pile hammer.

### BRIEF DESCRIPTION OF THE DRAWINGS

Various other objects, features and attendant advantages of the present invention will be more fully appreciated as the same becomes better understood from the following detailed description when considered in connection with the accompanying drawings, wherein like reference characters designate like or corresponding parts throughout the several views and in which:

FIG. 1 is an illustrative view of the preferred embodiment of the invention, and

FIGS. 2 to 4 are side vertical views of various embodiments of the fuel pump, manually operated valve and injection valve of the present invention.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

As shown in FIG. 1, the diesel pile hammer is provided with a ram 2 for vertically reciprocating in the cylinder 1. An anvil 3 is provided at the lower portion of the cylinder 1 in opposed position to the ram 2. A suction and exhaust port 8 is provided in the cylinder. A cam mechanism 4 makes contact with the ram 2, and a fuel pump 5 is driven thereby. An injector valve 6 for injecting fuel delivered from the fuel pump 5 is provided between the anvil 3 and the ram 2 within the cylinder. A manually operated valve 7 is provided in the fuel conduit connecting the fuel pump 5 to the injection valve 6 for the purpose of discharging fuel out of the conduit.

Referring to FIG. 2, a valve body 9 for externally sealing the fuel conduit is utilized as a manually operated valve. The fuel pump 5 has a valve body 11 and a plunger 10 vertically slidable in association with the cam mechanism 4. The fuel pump pressurizes the fuel introduced into the intake port 12 from the fuel tank etc. and delivers it to the outlet port 13. Fuel delivered from the outlet port 13 is directed to the injection valve 6, and is injected from the nozzle 16 when its pressure reaches a high pressure at which the valve body 14 is forced to open against the spring 15. In the discharge port 17, communicating to the outlet port 13 of the fuel pump 5, are provided a valve body 9 for externally sealing the discharge port, a spring member 18 for biasing the valve body toward the discharge port 17, and a lever for separating the valve body 9 from the discharge port 17 against the spring member 18.

A description of the operation of the present invention follows. While the diesel pile hammer is operated, fuel delivered from the fuel pump 5 forces the injector valve 6 to open and is continued to be injected from the nozzle 16 into the cylinder 1 in the same manner as in the case of a conventional cam, while the valve body 9 of the manually operated valve 7 closes the discharge port 17 by the action of spring member 18.

When it is necessary to quickly stop the diesel pile hammer the lever 19 is rocked to cause the valve body 9 to open the discharge port 17, whereby fuel in the fuel conduit connecting the fuel pump 5 to the injection valve 6 is directed to the fuel tank or atmosphere. Therefore, fuel is discharged into the discharge port 20 at a pressure far below the pressure in the conduit. Consequently, when the ram 2 is on its downward stroke, and the fuel pump is on its fuel delivering stroke, the pressure in the fuel conduit is reduced at once by the operation of the lever 19. Fuel injection is stopped through the injection valve 6 which opens only at a high predetermined pressure, such that the diesel pile hammer is also quickly stopped.

Utilization of the valve body 9 for externally blocking the fuel conduit permits reduction in the force required to actuate the lever for stopping the pile hammer during or immediately before its fuel injection. It can be said that this action will render easier stopping of the ram on its downward stroke. It should be remembered that the usual diesel pile hammer can be only stopped at the lower dead center.

FIG. 3 shows another embodiment of the invention wherein a valve body 21 for internally blocking the fuel conduit is used as a manually operated valve, and wherein a fuel pump 5, cam mechanism 4, and injection valve 6 are utilized, as in FIG. 2. The valve body 21 is biased by the spring member 24 to block the discharge port 23 directed to the chamber 22 of the fuel pump 5 and is connected to the lever 25 for thrusting the valve body 21 into the chamber 22.

For quickly stopping the machine, the lever 25 is rocked to discharge fuel within the chamber 22 to quickly stop its fuel injection. The discharge port 23 is directly connected to the chamber 22, such that it may be in parallel with the valve body 11 of the fuel pump 5, whereby difficulty of thrusting the valve body 21 into the fuel conduit may be eliminated and fuel may readily be discharged.

FIG. 4 shows still another embodiment wherein both valve bodies 26, 27 one for blocking the fuel conduit from the outside, the other from the inside, are used as manually operated valves, such valves being actuated by a single lever 28. The lever 28 is adapted to actuate the valve body 27 after it would actuate the valve body 26, and is so disposed as to leave a distance / with the valve body 26 when the valve body 27 is in the closed position. Thus, when the lever 28 is rocked, the valve body 26 is at first opened to reduce the pressure in the fuel conduit to a slight degree. Thereafter, the valve body 27 is opened to discharge a large amount of fuel into the discharge port 29. Thus, a large amount of fuel can be discharged in a short period of time by formally opening the valve body 26, which is liable to open at a high pressure as compared with valves for blocking from the inside under a high pressure, and thereafter by opening the valve body 27, which is liable to open at a reduced pressure. Consequently, easy and quick stopping of injection can be obtained.

Therefore, according to the present invention, if a diesel pile hammer is provided with a fuel pump actuated by a cam mechanism, it can quickly be stopped without generation of any overpressure or overstress thereby improving the safety and quickness in operation.

Obviously, many modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that within the scope of the appended claims, the invention may be practiced otherwise than as specifically described herein.

What is claimed as new and desired to be secured by Letters Patent of the United States is:

1. A fuel stop means for a diesel pile hammer having a vertically slidable ram and an anvil opposite to the ram at the lower portion of a cylinder, comprising:

a fuel pump driven by a cam mechanism making contact with said ram,

an injection valve for injecting fuel delivered from said fuel pump into said cylinder, and  
a manually operated valve provided in a fuel conduit for directing fuel from said fuel pump for discharging fuel therefrom, wherein said manually operated valve comprises a discharge port in communication with said fuel conduit, a valve body for blocking said fuel conduit from the outside thereof, a spring member biasing said valve toward said discharge port, and a lever separating said valve body from said discharge port against said spring member.

2. A fuel stop means for a diesel pile hammer having a vertically slidable ram and an anvil opposite to the ram at the lower portion of a cylinder, comprising:

a fuel pump driven by a cam mechanism making contact with said ram,

an injection valve for injecting fuel delivered from said fuel pump into said cylinder, and

a manually operated valve provided in a fuel conduit for directing fuel from said fuel pump for discharging fuel therefrom, wherein said manually operated valve comprises a discharge port in communication with said fuel conduit and arranged in parallel with said valve body of said fuel pump, a valve body for blocking said fuel conduit from the inside, and a lever for thrusting said valve into said fuel conduit against the internal pressure therein.

3. A fuel stop means for a diesel pile hammer having a vertically slidable ram and an anvil opposite to the ram at the lower portion of a cylinder, comprising:

a fuel pump driven by a cam mechanism making contact with said ram,

an injection valve for injecting fuel delivered from said fuel pump into said cylinder, and

a manually operated valve provided in a fuel conduit for directing fuel from said fuel pump for discharging fuel therefrom, wherein said manually operated valve comprises two valves, one of said valves comprising a discharge port in communication with said fuel conduit, a valve body for externally blocking said fuel conduit, a spring member for biasing said valve toward said discharge port, and a lever separating said valve from said discharge port against said spring member, the other of said valves comprising a discharge port in communication with said fuel conduit and arranged in parallel with said valve body of said fuel pump, a valve for internally blocking said fuel conduit, and a lever for thrusting said valve into said fuel conduit against pressure therein, said two valves being provided with a common lever which operates for causing the internally blocked valve to open after said internally blocked valve would cause the externally blocked valve to open.

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