

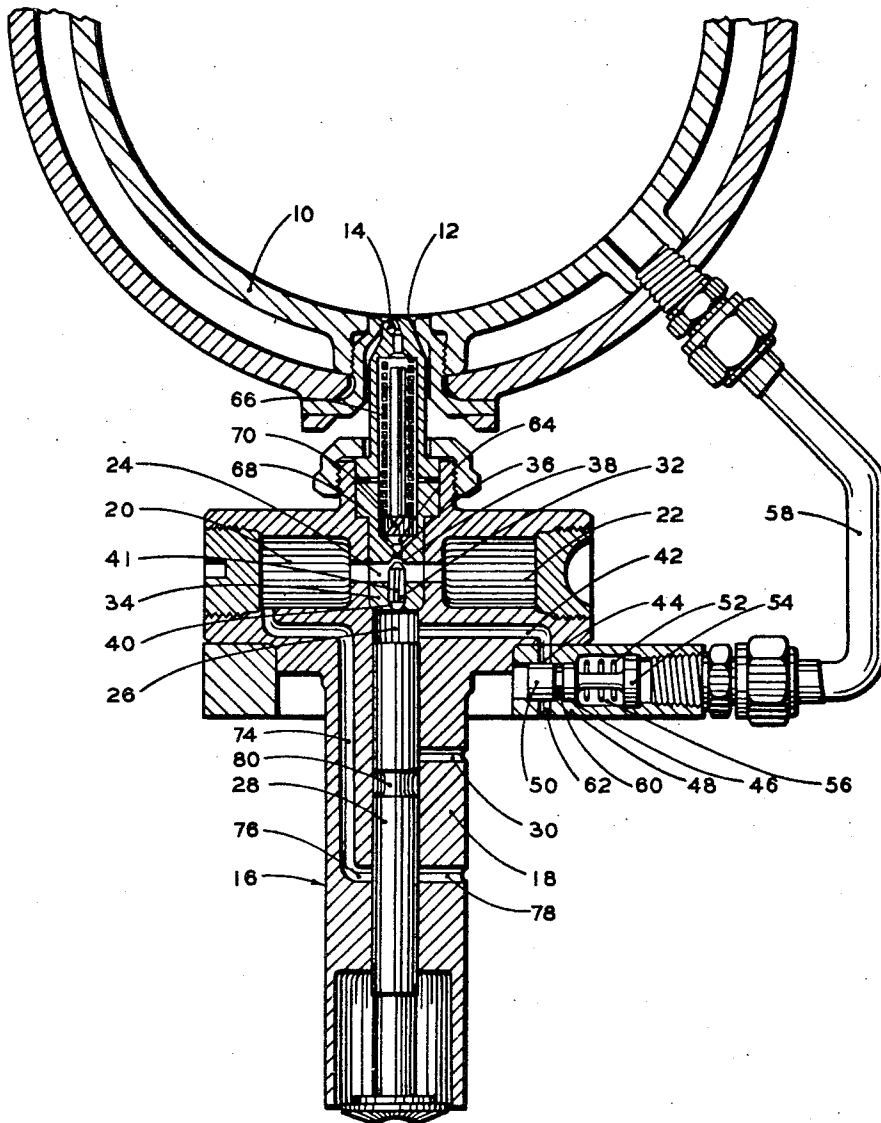
May 13, 1947.

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2,420,431

INJECTION TIMING

Filed Jan. 28, 1944



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2,420,431

INJECTION TIMING

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Application January 28, 1944, Serial No. 520,060

4 Claims. (Cl. 103—41)

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This invention relates to fuel injection apparatus.

In prior devices the airless injection of fuel to the engine cylinder has been caused by a reciprocating plunger which has started the injection stroke by closing an inlet port in the plunger bore and has terminated the injection by uncovering a discharge port. The injection is thus dependent upon the position of the plunger within the bore independent of other conditions. An object of this invention is to control the injection of fuel with respect to the pressure existing in the engine cylinder so that injection occurs when a predetermined pressure is reached.

A feature of this invention is an accumulator type of injection system in which the injection of fuel from the accumulator chamber into the engine cylinder is dependent upon the pressure within the engine cylinder and is thus independent of the position of the pump plunger.

Other objects and advantages will be apparent from the specification and claims and from the accompanying drawing which illustrate an embodiment of the invention.

The single figure is a diagrammatic view in section of the injection device.

The engine cylinder 10 has an opening 12 which receives the nozzle 14 of an injection device 16 by which fuel is directed into the engine cylinder.

The injection device includes a casing 18 having one or more accumulator chambers 20 and 22 interconnected by a passage 24. Fuel is delivered to these chambers from a bore 26 in which the injection plunger 28 is movable. The plunger may be reciprocated by a cam, not shown, engaging with the outer end of the plunger.

Fuel enters bore 26 through an inlet port 30 which is connected to a source of fuel and which is uncovered by the piston when the plunger is at the lower end of its stroke. As plunger 28 moves upwardly, fuel flows past an accumulator valve 32 sliding in a bore in a ring 34 mounted in the casing and through passage 24 into the accumulator chambers. Fuel is discharged from the accumulator chambers through a passage 36 to the nozzle 14. The accumulator valve 32 is movable to engage a seat 33 at the end of passage 36 or a seat 35 in ring 34. Valve 32 has a longitudinal groove 41 by which fuel may pass the valve.

Bore 26 has a discharge passage or vent 42 communicating with a port 44 intersecting a bore 46 in a body 48. A plunger valve 50 which is slidable in bore 48 normally covers port 44 being held in this position by a spring 52. Integral with

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plunger valve 50 is a piston 54 slidable in cylinder 56. The end of this cylinder is connected by a conduit 58 to the engine cylinder 10. As the pressure in the engine cylinder increases during the compression stroke, piston 54 is moved to the left, carrying with it the valve 50 until port 44 is connected by a groove 60 in the valve to a vent port 62. When this occurs, the pressure in bore 26 is suddenly relieved and valve 32, which has been held against seat 33 by the pressure of fuel on the lower end of the valve, moves into the position shown engaging seat 40 connecting chambers 20 and 22 with the nozzle for injection of fuel into the engine cylinder. In this way, injection of fuel takes place when a predetermined pressure is reached in the engine cylinder.

Nozzle 14 may have a check valve 64 held against its seat by a spring 66. The valve includes a plunger 68 sliding in a bore in nozzle 14 and having a groove 70 through which fuel flows past the plunger. Check valve 64 allows injection to continue until the pressure holding the valve open is overcome by the pressure of spring 66.

Air in the accumulator chambers 20 and 22 may be vented through a passage 74 in casing 18 which connects with the end of chamber 20. The opposite end of passage 74 forms a port 76 in bore 26 opposite a relief port 78. Plunger 28 has a groove 80 which, during the plunger stroke, connects ports 76 and 78 so that any air in the chambers is discharged through passage 74. Venting of the accumulator chambers is claimed in the copending application of Meitzler, Serial No. 486,624, filed May 11, 1943.

It is to be understood that the invention is not limited to the specific embodiment herein illustrated and described, but may be used in other ways without departure from its spirit as defined by the following claims.

I claim:

1. An accumulator injection device including an accumulator chamber, a valve normally closing the discharge port of the chamber and an injection pump for delivering fuel to said chamber, said valve being movable to open the port by a drop in pressure between the pump and chamber, in combination with pressure responsive means for procuring a drop in pressure between the pump and chamber.

2. An accumulator injection device including an accumulator chamber, a valve normally closing the discharge port of the chamber, an injection pump for delivering fuel to said chamber, said valve being movable to open the port by a drop in pressure between the pump and cham-

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ber, in combination with pressure responsive means for procuring a drop in pressure between the pump and chamber, said means including a vent and a valve movable by fluid pressure for opening said vent.

3. An injection device for an engine, including a casing, a plunger movable in a bore in said casing, a chamber into which fuel is pumped by the plunger, said chamber having an inlet passage communicating with said bore and an outlet communicating with the engine cylinder, a valve alternately closing said passage and said outlet, in combination with pressure controlled means for procuring shifting of the valve to open the outlet of the chamber.

4. An injection device for an engine including a casing, a plunger movable in a bore in said casing, a chamber into which fuel is pumped by the plunger, said chamber having an inlet passage communicating with said bore and an outlet communicating with the engine cylinder, a valve normally closing said outlet and being movable to open the outlet by a drop in pressure between

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the pump and chamber, in combination with pressure controlled means for procuring a drop in pressure between the plunger and chamber for causing said valve to be opened.

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