Jan. 9, 1945. C. T. DOMAN 2,366,701

LUBRICATING SYSTEM FOR INTERNAL-COMBUSTION ENGINES

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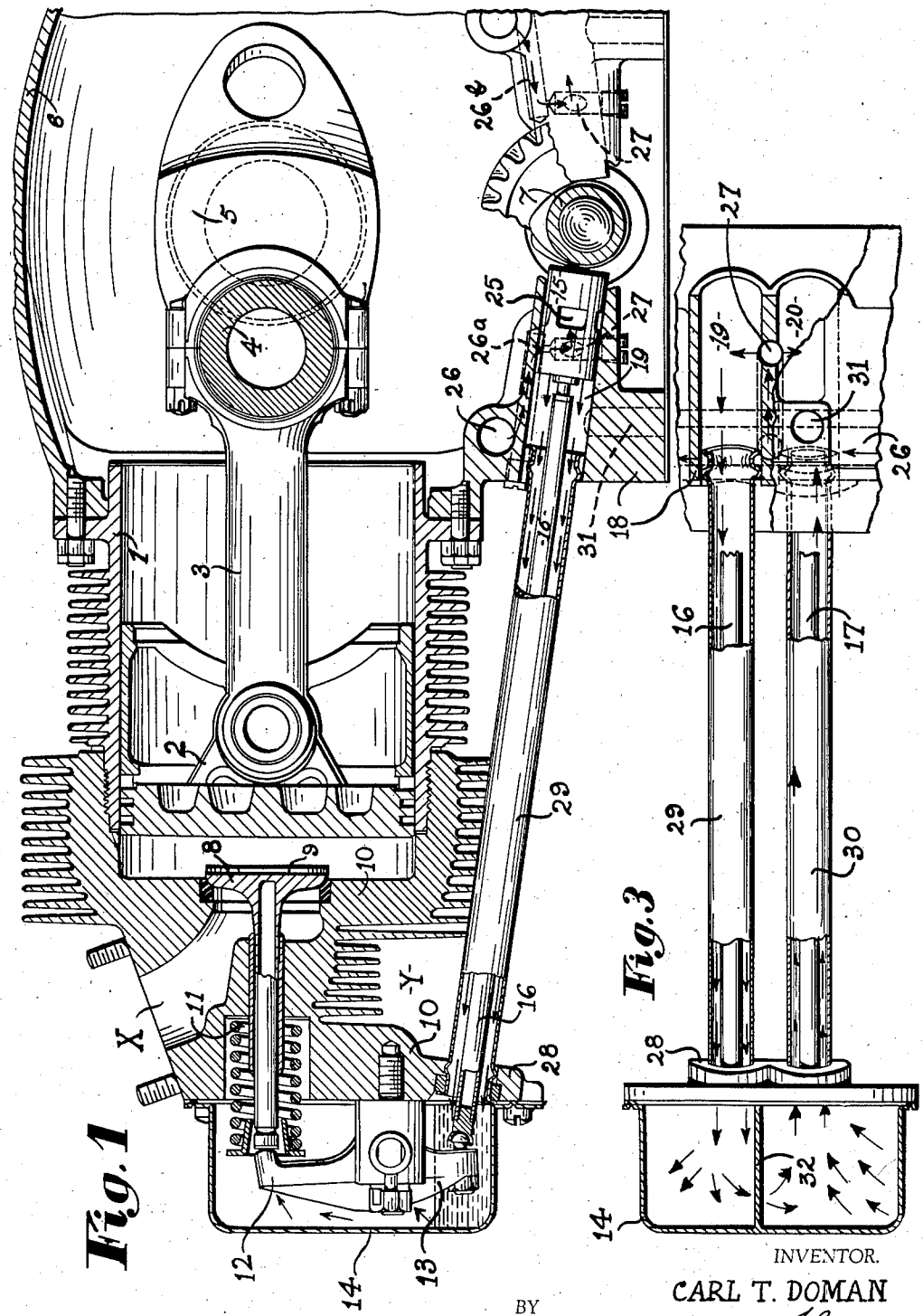


Fig. 1

Fig. 3

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Fig. 2

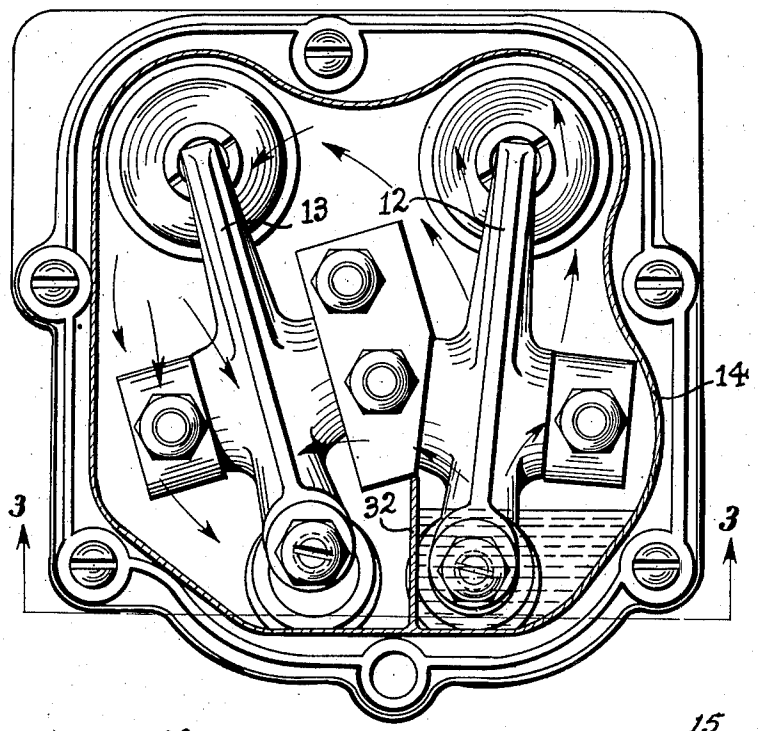
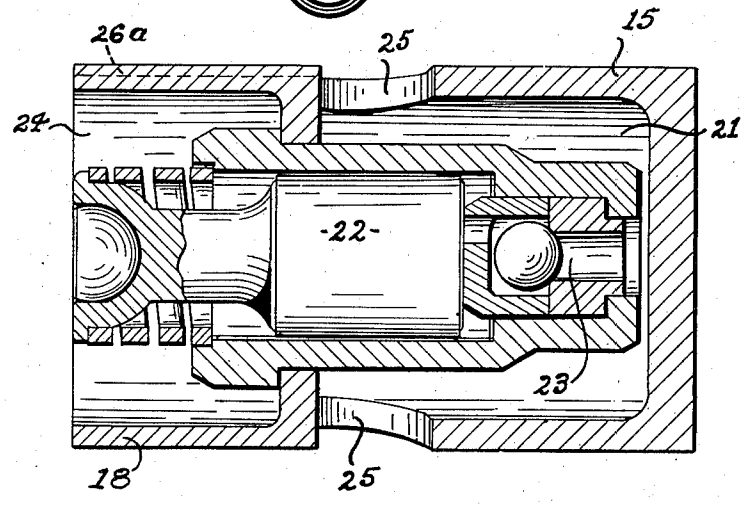


Fig. 4



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LUBRICATING SYSTEM FOR INTERNAL-COMBUSTION ENGINES

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2 Claims. (Cl. 123—90)

This invention relates to lubricating systems for the valve mechanisms of internal combustion engines, which engines also embody hydraulic valve lifters operated by the cam shaft to open the spring-seated intake and exhaust valves. The valve lifters are kept under hydraulic pressure to maintain zero clearances in the valve mechanism at all times and under all conditions and have a pumping action, and hence are constantly releasing or pumping out excess oil. It has for its object a method of lubricating and means, as the tubes housing the push rods, for conducting the excess oil to the movable parts of the valve mechanism, as the rocker arms of overhead valve mechanism and maintaining a reservoir of oil available for splash lubrication.

The invention consists in the novel features and in the combinations and constructions hereinafter set forth and claimed.

In describing this invention, reference is had to the accompanying drawings in which like characters designate corresponding parts in all the views.

Figure 1 is a fragmentary sectional view of a horizontally opposed, internal combustion engine of the valve-in-the-head type.

Figure 2 is a plan view of the head of one of the engine cylinders, the cover or casing for the rocker arm mechanism being removed.

Figure 3 is a fragmentary sectional view, partly in elevation, taken approximately on lines 3—3, Figure 1.

Figure 4 is a detail view of one form of hydraulic valve lifter.

1 designates a cylinder of one bank of cylinders of a horizontally opposed or flat engine; 2 the piston working in the cylinder; 3 the connecting rod; 4 the crank on the crank shaft 5. The crank shaft 5 is suitably mounted in the crank case 6 of the engine. 7 deignates the cam shaft mounted in the crank case and geared to the crank shaft in any suitable manner. 8 and 9 designate intake and exhaust poppet valves in the head 10 of the cylinder, these being closed when the opening force of the valve mechanism is released in the usual manner against their seats by springs, as 11. The head is formed with intake and exhaust ports X and Y in any suitable manner. The valves are operated by valve mechanism including movable members here shown as rocker arms 12 and 13 suitably pivoted between their ends on the head 10 and operated through mechanism, as push rods, from the cam shaft. 14 is a cover or casing on the head 10 for the rocker arms 12, 13 and in this construction forming a reservoir or sump for oil, which is splashed during the rocking of the rocker arms in the casing to lubricate the pivotal and other points of the valve mechanism.

15 designates hydraulic valve lifters, which cooperate with cams on the cam shaft 7, the motion of these lifters being transmitted to the rocker arms for the intake and exhaust valves by push rods 16 and 17 respectively. The construction of the valve lifters forms no part of this invention, and they are pertinent to this invention, in so far as they have a pumping action, and the oil pumped thereby or expelled or leaking therefrom under the pumping action is conducted to the casing or cover 14. The valve lifter here shown comprises an outer tubular member 18, which is slidably mounted in the passage or bore 19 or 20 in the crank casing, an inner cylinder or plunger chamber 21 fixed in the outer member 18 and having a plunger 22 therein, which thrusts against the end of the push rod 16 or 17, the chamber in which the plunger works communicating with the interior of the outer member 18 through a check-valve controlled passage 23. The plunger chamber 21 opens into a second chamber or compartment 24 in the outer member 18 and into which the oil discharges or leaks from one side of the plunger 22 to the other, during the operation of the lifter and the valve mechanism. The outer member 18 is also formed with inlet passages 25 through which oil under pressure passes from a feed passage 26 in the wall of the crank case and with ducts 26^a, 26^b leading therefrom and opening at 27 into the bores in which the valves lifters 15 are mounted. Pressure is applied to the oil in the passage 26 in any suitable manner. The oil passes from the crank case through the passage 26 and into the valve lifters through the passages 25 and also through the check-valve controlled passages 22 into the plunger chambers or cylinders 21 where it acts on the plunger to always take up any lost motion that would otherwise occur, due to variations in clearances between the push rods and the rocker arms and the rocker arms and the valve stems, or in other words, to maintain a zero clearance. As the valves seat under their springs 11, some of the oil will be forced or caused to leak past the plunger 22 into the chamber 24. This leaking action is in effect a pumping action, which is constantly taking place and building up during the operation of the engine, so that oil is being expelled at all times into the chamber 24 and ex-

pelled from the bore 19 during the reciprocation of the lifter by the cam shaft.

There are valve lifters 15 for the intake and exhaust valves, one for each, and these are arranged in the passages 19 and 20 respectively, which are located side by side. The duct 27 is common to the two passages in the valve lifters and is located in the separating wall between the two passages or bores 19, 20.

The head 10 of the cylinder is formed with a laterally or downwardly projecting flange 28 in the flat engine construction illustrated, the flange extending beyond the cylinder walls at one side, as the lower side, and being opposed to the portions of the crank case in which the valve lifters are located. The push rods 16 extend through openings in the flange 28 and thrust against the rocker arms 12, 13. The push rods 16, 17 are enclosed in tubes 29 and 30 extending between the flange and the opposing portion of the crank case and having their ends anchored in the flange and in the crank case, the inner ends being located to receive the oil pumped by the valve lifters and the outer ends opening into the casing 14. The bore for one only of the valve lifters is provided with a return outlet 31 to the crank case or other oil sump from which the oil is pumped under pressure to the inlet 26. Thus, during the operation of the valve lifters, one of the valve lifters pumps the excess oil through the tube 29 to the casing 14, where it accumulates in a pool and overflows into the other tube 30 to the crank case through the outlet 31. The oil pumped by the other valve lifter passes directly out through the outlet 31.

The casing 14 is provided with a baffle 32 on the lower side thereof. The tubes open into the casing on opposite sides of the baffle. The ends of the rocker arms also extend on opposite sides of the baffle. The baffle maintains a pool on one side thereof which overflows into the other side and returns through the tube 30. During the action of the rocker arms, the oil of the pool is splashed over the movable members or rocker arms and their bearings and their points of contact with the valve stems and drains out through the tube 30.

In case more oil is needed, that is, due to the normal leaking of the valve lifter or passage may be provided along the lifter, so that some of the oil forced into the lifter chamber 19 passes along the lifter under the pressure of the oil from the passage 26 to in front of the lifter, augmenting the oil leaking from the lifter. This passage may be provided by flattening the lifter, as at 33. The passage 33 constitutes a by-pass around the lifter 19 from the inlet 27 to the outer or front side of the lifter.

The construction of the engine including the valves, rocker arms, push rods and tubes in which they are located, and the valve lifters, per se, forms no part of this invention. The invention lies in utilizing the pumping action of the valve lifters to lubricate the overhead valve mechanism.

What I claim is:

1. A valve mechanism lubricating system for internal combustion engines including a cylinder, spring-seated intake and exhaust valves for the cylinder, a piston, a crank shaft and a cam shaft equipment, valve mechanism operated by the cam shaft including movable members, and hydraulic valve lifters operating said members and operated by the cam shaft, the lifters being of the type to which oil is supplied under pressure and having a pumping or leaking action during the operation of the engine, the engine being formed with bores in which the lifters work, a casing enclosing said movable members, tubes between the casing and the bores for the valve lifters respectively, push rods in the tubes for transferring the movements of the lifters to said members respectively, one tube only having a return outlet adjacent the lifter, all whereby the oil pumped by the other lifter is passed through the companion tube to the casing and the members therein and drains out through the former tube to the return outlet.

2. A valve mechanism lubricating system for internal combustion engines including a cylinder, spring-seated intake and exhaust valves for the cylinder, a piston, a crank shaft and a cam shaft equipment, valve mechanism operated by the cam shaft including movable members, and hydraulic valve lifters operating said members and operated by the cam shaft, the lifters being of the type to which oil is supplied under pressure and having a pumping or leaking action during the operation of the engine, the engine being formed with bores in which the lifters work, a casing enclosing said movable members, tubes between the casing and the bores for the valve lifters respectively, push rods in the tubes for transferring the movements of the lifters to said members respectively, one tube only having a return outlet adjacent the lifter, all whereby the oil pumped by the other lifter is passed through the companion tube to the casing and the members therein and drains out through the former tube to the return outlet, said other lifter having a by-pass located to pass the oil under pressure directly from the bore in which said other lifter works to augment the oil leaking from the same.

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