Aug. 30, 1932. R. N. DU BOIS 1,874,471

INTERNAL COMBUSTION ENGINE

Filed July 28, 1930

Fig. 1.

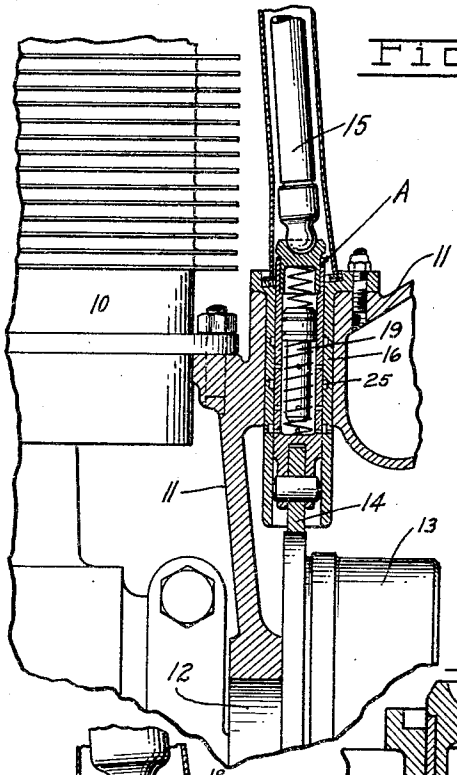


Fig. 5.

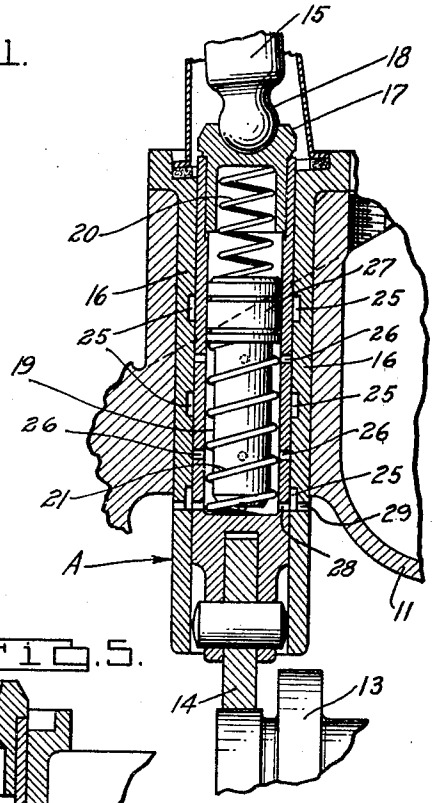
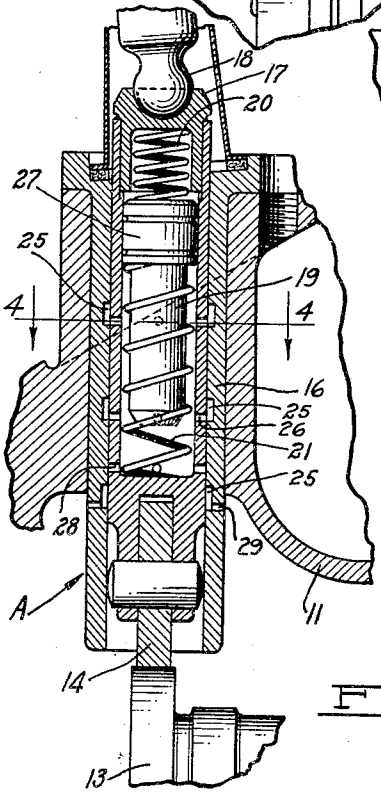


Fig. 2.



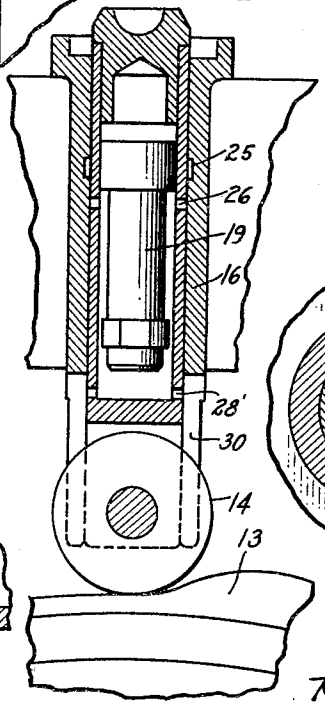


Fig. 3.

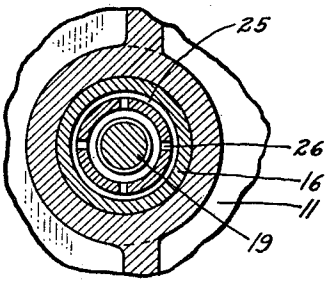


Fig. 4.

INVENTOR.
RALPH N. DUBOIS.

BY W. W. Harris

ATTORNEY.

Patented Aug. 30, 1932 1,874,471

UNITED STATES PATENT OFFICE

RALPH N. DU BOIS, OF DETROIT, MICHIGAN, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CONTINENTAL AIRCRAFT ENGINE COMPANY, A CORPORATION OF DELAWARE

INTERNAL COMBUSTION ENGINE

Application filed July 28, 1930. Serial No. 471,110.

My invention relates to internal combustion engines and more particularly to a tappet structure therefor. Although I have illustrated my invention in conjunction with an overhead valve radial engine for use with aircraft, it will be obvious that the principle of my invention may be incorporated in engines other than the radial type and in engines other than the overhead valve type since this tappet structure may be used in all types of engines employing this general type of valve tappet.

Such tappets are usually lubricated by an oil spray from the engine crankcase, and the oil tends to creep up the tappet guide past the tappet. The leakage of this oil is especially detrimental to the efficient operation of an aircraft engine wherein relatively high constant engine speeds are obtained increasing the tendency of the oil to leak past the tappet.

It is the object of my present invention to facilitate the efficient operation of an internal combustion engine by providing means for eliminating the waste of oil or other lubricant past the tappet.

A further object of my invention is to eliminate oil waste past the tappet of an internal combustion engine by providing means which automatically returns excess accumulations of the oil to the engine crankcase.

For a more detailed understanding of my invention, reference may be had to the accompanying drawing which illustrates one form which my invention may assume, and in which:

Fig. 1 is a fragmentary sectional view of an internal combustion engine showing, a tappet structure constructed in accordance with my invention,

Fig. 2 is an enlarged sectional view of the tappet structure when the same is down.

Fig. 3 is an enlarged sectional view of the tappet structure when the same is up,

Fig. 4 is a traverse sectional view taken substantially on the line 4—4 of Fig. 3, and

Fig. 5 is a sectional view of a tappet of modified construction.

An internal combustion engine having overhead valves is usually provided with a tappet which serves to impart motion to a push rod. In the accompanying drawing I have chosen to illustrate a fragmentary portion of a radial aircraft engine comprising a cylinder 10, a crankcase 11, in which is supported the usual crankshaft 12. A cam 13 is supported by said crankshaft and engages a roller 14 carried by a tappet structure A, the cam surfaces of the cam causing the tappet to reciprocate, thereby imparting a reciprocating movement to the push rod 15 which may be connected with the usual form of valve rocker arm (not shown) for operating the engine valve (not shown). The tappet structure is slidably supported in a tappet guide 16 carried by the crankcase.

The roller 14 is preferably rotatably supported at the lower end of the tappet A. The tappet is hollow, and the open end of the tappet is closed by a fixture 17 having a socket for receiving the rounded end 18 of the push rod 15. The hollow tappet is provided with a floating plunger 19, light springs 20 and 21 being located respectively above and below the plunger, if so desired, so as to normally maintain the plunger at an intermediate position as shown in Fig. 1. However, I have found that the use of these springs is not absolutely necessary as a device without springs as illustrated in Fig. 5 will operate quite satisfactory.

The tappet is lubricated by oil spray from the engine crankcase. The tappet guide is provided with a plurality of spaced pockets or annular grooves 25 in which is collected the oil that creeps up the inner wall of the tappet guide. The tappet is provided with inlet ports 26 extending through the wall, the ports and grooves being so arranged that during the upper portion of the stroke of the tappet the grooves are in communication with the interior of the tappet below the head 27 of the plunger. The tappet is provided with outlet ports 28 which are so located that they are brought into registration with the lowermost groove 25 during the lower portion of the stroke of the tappet, said lowermost groove being open to the crankcase through ports 29. The outlet ports 28 are covered and

sealed by the tappet guide during the upper portion of the stroke of the tappet.

The construction illustrated in Fig. 5 shows the outlet ports 28′ communicating with the crankcase through the slot or cut-away portion 30 of the tappet guide, these outlet ports 28′ being also covered and sealed by the tappet guide during the upper portion of the stroke of the tappet.

As the engine is operated, the device is actuated as follows: the tappet is accelerated upwardly by the cam 13, during which time the inertia of the plunger 19 causes the plunger to travel to the lower end of the tappet compressing the light spring 21 and forcing out whatever oil or air may be in the space below the plunger through the outlet ports 28. During the upper portion of the tappet stroke, the tappet is decelerated by the valve spring (not shown) and the inertia of the plunger causes the plunger to move to the upper end of the tappet, creating a partial vacuum below the plunger. As the space below the plunger is in communication with the annular oil groove or grooves 25 through the inlet ports 26 that register therewith during this part of the cycle, the suction pressure tends to withdraw the excess oil accumulations from the groove into the interior of the hollow tappet. As the plunger is decelerated at the lower end of the stroke, the inlet ports 26 are covered and sealed by the tappet guide and the outlet ports are uncovered, and the plunger again moves to the lower end of the tappet thereby expelling the oil and air that has been sucked into the hollow tappet through the outlet holes 29 into the crankcase of the engine.

It will be noted that I have provided a simple device that is automatically actuated in response to the movement of the tappet for withdrawing by suction any excess oil that tends to creep up the tappet guide and returning said excess oil to the engine crankcase, thereby facilitating the efficient operation of the engine.

Although I have illustrated but one form of my invention and have described in detail but a single application thereof, it will be apparent to those skilled in the art to which my invention pertains that various modifications and changes may be made therein without departing from the spirit of my invention or from the scope of the appended claims.

What I claim as my invention is:

1. In an internal combustion engine having a crankcase, a tappet guide supported thereby, a hollow tappet reciprocating in said tappet guide, the interior of said tappet communicating with said tappet guide, means for reciprocating the tappet, and means within said tappet and actuated by movement of the tappet for creating suction pressure to remove excess oil accumulations from said tappet guide.

2. In an internal combustion engine having a crankcase, a tappet guide supported thereby, a hollow tappet reciprocating in said tappet guide, means for reciprocating the tappet, and suction means within said guide and actuated by movement of the tappet for periodically removing excess oil accumulations from said tappet guide.

3. In an internal combustion engine having a crankcase, a tappet guide supported thereby, a hollow tappet reciprocating in said tappet guide, means for reciprocating the tappet, said tappet guide provided with a pocket in which excess oil is accumulated, and suction means within said tappet for periodically removing the excess oil accumulations from said pocket.

4. In an internal combustion engine having a crankcase, a tappet guide supported thereby, a hollow tappet reciprocating in said tappet guide, means for reciprocating the tappet, said tappet guide provided with a pocket in which excess oil is accumulated and which communicates with the interior of said tappet, and means responsive to movement of the tappet for periodically creating a suction pressure within said tappet to remove the excess oil accumulations from said pocket.

5. In an internal combustion engine having a crankcase, a tappet guide supported thereby, a hollow tappet reciprocating in said tappet guide, means for reciprocating the tappet, said tappet guide provided with an annular groove in which excess oil is accumulated and which communicates with the interior of said tappet, suction means for periodically removing the excess oil accumulations from said annular groove into the interior of said hollow tappet, and means for discharging said oil into the crankcase.

6. In an internal combustion engine having a crankcase, a tappet guide supported thereby, a hollow tappet reciprocating in said tappet guide, means for reciprocating the tappet, said tappet guide provided with a pocket in which excess oil is accumulated, means for periodically placing the pocket in open communication with the interior of said hollow tappet, and means for creating suction pressure within said tappet for periodically withdrawing the excess oil accumulations from said pocket.

7. In an internal combustion engine having a crankcase, a tappet guide supported thereby, a hollow tappet reciprocating in the tappet guide, said tappet guide provided with a pocket in which excess oil is accumulated, means for periodically placing the pocket in open communication with the interior of said hollow tappet, a floating plunger contained within said hollow tappet and relative movable therewith, said plunger arranged to periodically create a suction pressure within said tappet to remove the excess oil accumulations from the pocket when said pocket is in

communication with the interior of said tappet, and means for discharging said oil accumulations into said crankcase.

8. In an internal combustion engine having a crankcase, a tappet guide supported thereby, a hollow tappet reciprocating in said tappet guide, means for reciprocating the tappet, said tappet guide provided with a pocket in which excess oil is accumulated, a floating plunger contained within said hollow tappet and relatively movable therewith, said tappet provided with inlet and outlet ports below said plunger, said inlet ports arranged to communicate with said pocket during the upper portion of the stroke of said tappet, the inertia of said plunger causing the same to move relative to the tappet upon deceleration of the tappet to create a suction force withdrawing the oil accumulations from said pocket.

9. In an internal combustion engine having a crankcase, a tappet guide supported thereby, a hollow tappet reciprocating in said tappet guide, means for reciprocating the tappet, said tappet guide provided with a pocket in which excess oil is accumulated, a floating plunger contained within said hollow tappet and relatively movable therewith, said tappet provided with inlet and outlet ports below said plunger, said inlet ports arranged to communicate with said pocket during the upper portion of the stroke of said tappet, said plunger actuated in response to inertia forces set up upon accelerating and decelerating the tappet and arranged to create a suction pressure within said tappet to withdraw the excess oil accumulations from the pocket during the upper portion of the stroke of the tappet and to force said oil accumulations through said outlet ports during the lower portion of the stroke of the tappet.

10. In an internal combustion engine having a crankcase, a tappet guide supported thereby, a hollow tappet reciprocating in said tappet guide, means for reciprocating the tappet, and suction pressure means within said hollow tappet for withdrawing excess oil accumulations from said tappet guide.

11. In an internal combustion engine having a crankcase, a tappet guide supported thereby, a hollow tappet reciprocating in said tappet guide, means for reciprocating the tappet, and suction pressure inducing means within said hollow tappet actuated in response to movement of the tappet for withdrawing excess oil accumulations from said tappet guide and discharging the same into the engine crankcase.

12. In an internal combustion engine having a crankcase, a tappet guide supported thereby, a hollow tappet reciprocating in said tappet guide, means for reciprocating the tappet, said tappet guide provided with a pocket, and suction pressure means within said hollow tappet for periodically withdrawing excess oil accumulations from said pocket into said hollow tappet.

13. In an internal combustion engine having a crankcase, a tappet guide supported thereby, a hollow tappet reciprocating in said tappet guide, means for reciprocating the tappet, said tappet guide provided with a pocket in which excess oil is accumulated, means for alternately placing the interior of the tappet in communication with pocket and the crankcase respectively, a plunger slidably supported within said hollow tappet and relatively movable therewith, said plunger caused to be actuated in response to accelerated and decelerated movement of the tappet to create suction pressure within said hollow tappet for withdrawing excess oil accumulations from the pocket into the interior of the hollow tappet and to subsequently force said oil accumulations from the interior of the tappet into said crankcase.

In testimony whereof I affix my signature.

RALPH N. DU BOIS.