June 10, 1941. W. G. LUNDQUIST 2,245,207

CRANKCASE BREATHER

Filed Dec. 9, 1939

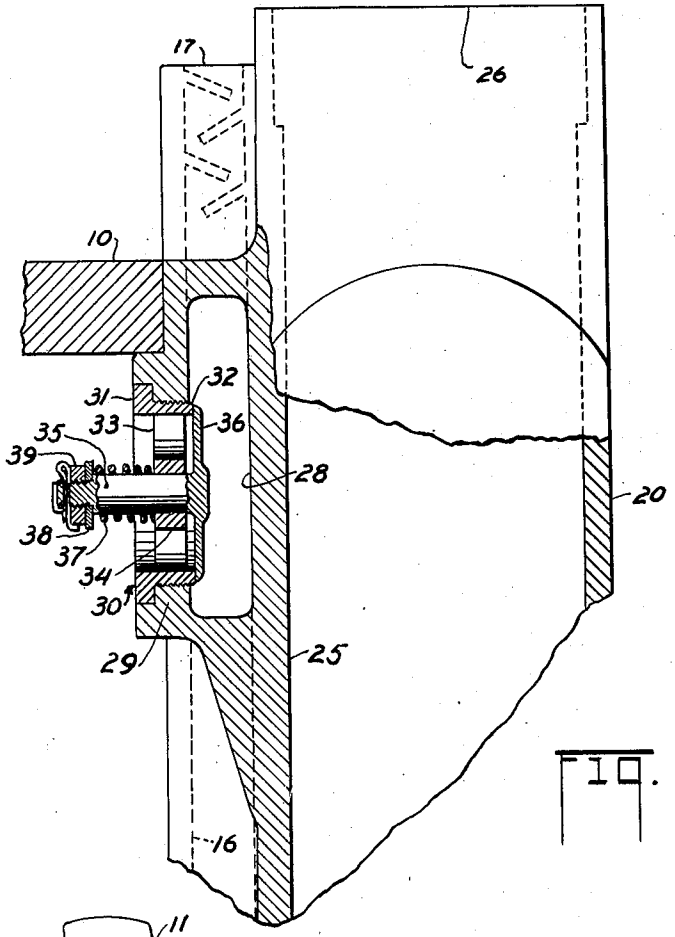


FIG. 2.

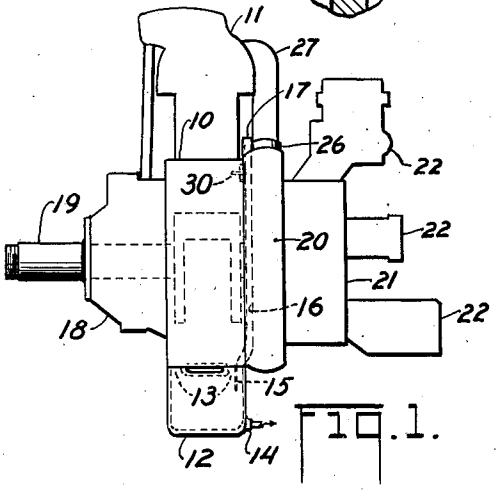


FIG. 1.

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CRANKCASE BREATHER

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7 Claims. (Cl. 121—194)

This invention relates to crankcase breathing systems for internal combustion engines and is particularly concerned with an auxiliary elevated breather associated with a normal breather which latter connects with the interior of the engine crankcase through an oil sump.

In the aircraft engine art considerable experimentation has taken place in attempting to provide breathing means for the engine crankcase which will minimize the issue of oil vapor and which will also promote the scavenging of oil from the crankcase. The usual aircraft engine utilizes a dry sump lubrication system—that is, oil is forced to the bearing parts of the engine from an external oil tank, surplus oil falling to the bottom of the crankcase and passing to a small sump from which oil is constantly withdrawn by a scavenging pump for return to the oil reservoir. Certain presently built engines utilize a breathing passage which connects with this small oil sump and, since there is a constant leakage of combustion gases into the crankcase, these gases pass, with surplus oil, into the sump to promote the flow of scavenged oil thereto. Thence, the oil is drawn from the bottom of the sump and the gases may pass from the sump through a cored passage in the crankcase wall to an elevated part of the engine whence they issue to the atmosphere.

Such a system is generally quite satisfactory but it has been found that after an engine has been idle for some time, a considerable amount of oil may accumulate in the sump and in the bottom of the crankcase. When the engine is started, crankcase pressure builds up before the scavenging oil pump has had time to remove the surplus oil from the sump and accordingly, the crankcase pressure may blow oil upwardly through the breather for issue to the atmosphere which is troublesome since it not only wastes oil but soils the engine.

It is an object of this invention to provide an auxiliary elevated breather responsive in its action to crankcase pressure to avoid the above mentioned difficulty, and it is a further object of the invention to provide a dual breathing system one part of which is operable during normal operation and the other part of which is operable during engine starting.

To appreciate further objects of the invention, reference may be made to the annexed detailed description in connection with the drawing in which:

Fig. 1 is a side elevation of an aircraft engine equipped with the invention, showing certain of the componet parts in dotted lines, and

Fig. 2 is an enlarged detailed section through a portion of the engine crankcase.

Referring first to Fig. 1, 10 indicates an engine crankcase to which a plurality of radially disposed cylinders such as 11 are secured, the bottom of the crankcase 10 having attached thereto an oil sump 12 into which oil may flow from the bottom of the crankcase through passages 13. Oil is normally withdrawn from the sump 12 through a connection 14. The hollow of the sump is likewise provided with an opening 15 which connects with a breather passage 16 formed in the crankcase wall terminating at the top of the crankcase in an opening 17. The other conventional parts of the engine comprise a nose section 18 from which the crankshaft or propeller shaft 19 projects, a supercharger section 20 immediately to the rear of the crankcase, and an accessory section 21 secured to the rear of the supercharger section upon which various mechanisms, such as 22, are secured.

Fig. 2 shows the upper rear part of the crankcase and supercharger housing in section wherein 25 is the wall forming the partition between the crankcase and supercharger cavities and in which wall the breather passage 16 is formed. The element 26 on the supercharger housing comprises one of the several supercharger outlets adapted to be connected to an engine cylinder by an intake manifold pipe 27.

The wall 25 is provided with a recess 28 freely communicating with the breather passage 16 and in the wall 29 thereof, separating the breather passage from the crankcase interior, is disposed a valve 30 which comprises an element 31 screwed into the wall and having a flat seat 32. Spoke-like elements 33 extend inwardly from the element 31 to carry a bushing 34 which forms a guide for a valve stem 35 equipped with a valve head 36 engageable at its edges with the seat 32. A light spring 37 embraces the stem 35 and bears at one end on the guide 34 and at its other end on a washer 38 secured to the valve stem by a nut 39.

In effect, the assembly 30 comprises a very lightly loaded safety valve. Ordinarily, during engine operation, the valve spring 37 will have sufficient strength to hold the valve closed against low values of crankcase compression. During engine starting, after the engine has been idle, there may be a sufficient accumulation of oil in the sump 12 so that it covers the opening 15. When the engine is started, crankcase compression builds up tending to drive the oil up through the breather passage 16. The safety valve spring 37 will be

sufficiently light to allow opening of the valve 36 before oil has risen an appreciable amount in the breather passage 16, whereupon crankcase compression is relieved through the valve 36 until such time as the normal engine scavenging pump has emptied the sump 12 to allow normal engine breathing therethrough.

While I have described my invention in detail in its present preferred embodiment, it will be obvious to those skilled in the art, after understanding my invention, that various changes and modifications may be made therein without departing from the spirit or scope thereof. I aim in the appended claims to cover all such modifications and changes.

I claim as my invention:

1. In an engine crankcase in combination, a sump at the bottom thereof into which oil and vapors pass and having an oil outlet and a breathing outlet, a normal breathing conduit extending from the breathing outlet and opening to the atmosphere at an elevated part of the engine, and a spring-loaded valve in an elevated part of the crankcase above the sump opening to the atmosphere to relieve crankcase pressure should the sump breathing outlet be immersed in oil.

2. In an engine crankcase having a sump therebelow into which oil and crankcase vapors are adapted to pass, a normal breathing conduit extending from an outlet in the upper part of said sump to the atmosphere at a point close to the top of said crankcase, and an outwardly opening lightly loaded valve between the crankcase and said conduit elevated above the sump outlet responsive in its opening to excessive crankcase pressure to relieve crankcase pressure should the sump outlet be immersed in oil.

3. In an engine crankcase comprising an end partition having a breather duct formed therein and extending substantially vertically thereacross, a sump at the bottom of said crankcase with which said duct is in communication, and a spring-loaded valve in the wall opening from the crankcase to the duct, at an elevated part of the crankcase, to establish direct communication between the crankcase and duct without passing through said sump should the sump be filled with oil.

4. In an engine crankcase comprising an end partition having a breather duct formed therein, a sump at the bottom of said crankcase with which said duct is in communication, and a spring-loaded valve in the wall opening from the crankcase to the duct, at an elevated part of the crankcase, to establish direct communication between the crankcase and duct without passing through said sump, said valve being resiliently loaded toward a closed position, the loading being of such order as to be overcome by crankcase pressure less than that necessary to force oil within the sump from the breather duct opening.

5. In an engine crankcase having a bottom sump into which surplus oil and crankcase gases are adapted to pass, means for scavenging oil from said sump, a crankcase breathing conduit entering said sump above the scavening means, and an auxiliary breather entering said crankcase at an elevated part of the crankcase, said elevated breather including a valve and a light normally holding said valve closed against pressure within the crankcase.

6. In combination in a crankcase for a radial cylinder engine having drain openings in the lowermost part thereof, a sump unit secured to the case and in communication with said openings, an oil scavenge outlet in the bottom of the sump, a breathing oultlet in the sump located above the oil outlet, whereby oil and vapor pass from the crankcase into the sump and issue from respective sump outlets during normal engine operation, the vapor passing to the sump from the crankcase augmenting the flow of oil thereto, a secondary breather opening in the crankcase proper for issuing vapor direct from the crankcase without the vapor passing through the sump, and a lightly loaded check valve normally closing said secondary breather opening the loading thereof being sufficient to hold the valve closed against normal crankcase compression during engine running.

7. In combination in a crankcase for a radial cylinder engine having drain openings in the lowermost part thereof, a sump unit secured to the case and in communication with said openings, an oil scavenge outlet in the bottom of the sump, a breathing outlet in the sump located above the oil outlet, whereby oil and vapor pass from the crankcase into the sump and issue from respective sump outlets during normal engine operation, the vapor passing to the sump from the crankcase augmenting the flow of oil thereto, a secondary breather opening in the crankcase proper for issuing vapor direct from the crankcase without the vapor passing through the sump, and a lightly loaded check valve normally closing said secondary breather opening the loading thereof being sufficient to hold the valve closed against normal crankcase compression during engine running, said crankcase having a substantially vertical breather passage formed in a wall thereof, open at its upper end to the atmosphere, with which said sump breathing outlet and secondary breather opening are in communication.

WILTON G. LUNDQUIST.

CERTIFICATE OF CORRECTION.

Patent No. 2,245,207. June 10, 1941.

WILTON G. LUNDQUIST.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 2, second column, line 11, claim 5, after the word "light" insert --spring--; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of July, A. D. 1941.

Henry Van Arsdale,
Acting Commissioner of Patents.

(Seal)