Oct. 26, 1965 R. C. ROBINSON 3,213,930

OIL TEMPERATURE REGULATORS FOR INTERNAL COMBUSTION ENGINES

Filed June 1, 1964

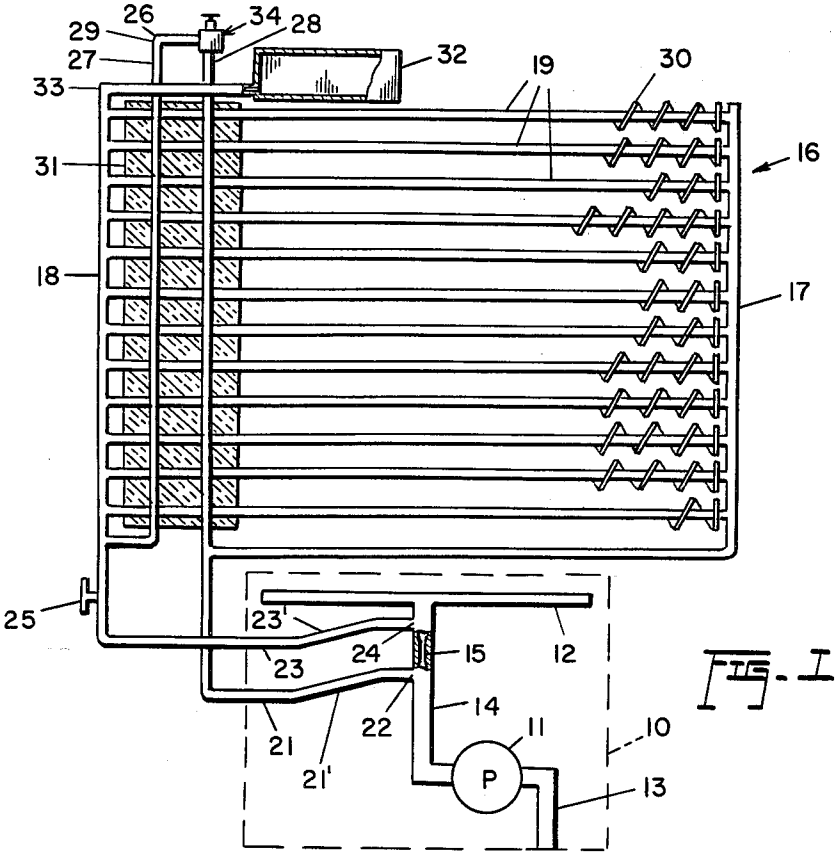


FIG. 1.

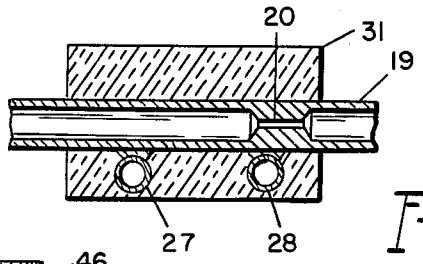


FIG. 2.

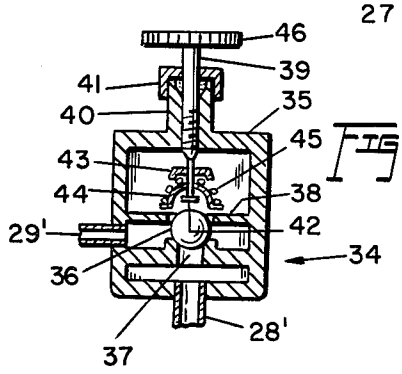


FIG. 3.

INVENTOR

ROBERT CLAYTON ROBINSON

BY Fetherstonhaugh & Kent

ATTORNEYS

United States Patent Office

3,213,930

Patented Oct. 26, 1965

3,213,930

OIL TEMPERATURE REGULATORS FOR INTERNAL COMBUSTION ENGINES

Robert Clayton Robinson, Box 115, Snow Lake, Manitoba, Canada

Filed June 1, 1964, Ser. No. 371,719
6 Claims. (Cl. 165—38)

This application is a continuation-in-part of abandoned application Serial No. 278,193, filed May 6, 1963.

My invention relates to new and useful improvements in oil temperature regulation devices adapted to be used with the high pressure oil system of conventional internal combustion engines and the like, the principal object and essence of my invention being to provide a device of the character herewithin described which consists of a circulating regulator device situated above the engine and in by-pass circuit with the high pressure system, containing restricted orifices which prevents full circulation of the oil through the regulator until a pre-determined temperature has been reached and also including an air receiver to prevent air locks and to purge the system when the engine stops operating.

Oil regulator systems have been used before in conjunction with internal combustion engines, but these normally do not incorporate means to eliminate air within the system each time the engine is operated, neither do they incorporate means adapted to empty the regulator when the engine stops operating. Furthermore, means are not provided to facilitate the transfer of heat to the oil cooler in order to bring it into operation as soon as possible.

My device overcomes these disadvantages as will hereinafter be described.

A further object of my invention is to provide a device of the character herewithin described which is readily adaptable to conventional internal combustion engines and can be situated within the cooling air stream of the fan of the engine.

Yet another object of my invention is to provide a device of the character herewithin described in which only a portion of the engine oil is circulated through the regulator, the remainder going direct from the pump to the high pressure system in the conventional manner.

With the foregoing objects in view, and such other objects and advantages as will become apparent to those skilled in the art to which this invention relates as this specification proceeds, my invention consists essentially in the arrangement and construction of parts all as hereinafter more particularly described, reference being had to the accompanying drawings in which:

FIGURE 1 is a front elevation of my device sectioned in part to show the interior thereof.

FIGURE 2 is an enlarged fragmentary cross sectional top plan view showing the relationship between the oil return tube and the heat transfer tubes.

FIGURE 3 is an enlarged sectional view of the pressure control valve.

In the drawings like characters of reference indicate corresponding parts in the different figures.

Proceeding therefore to describe my invention in detail, it will be seen upon reference to the accompanying drawings that I have illustrated in phantom, the front end view of a conventional engine **10** including a schematic representation of a conventional oil pump **11** having an inlet **13** situated within the oil pan (not illustrated) and driven by the engine in the conventional manner.

An oil delivery conduit **14** extends from the oil pump **11** to the high pressure system gallery **12** of the engine, said oil delivery conduit being provided with a restricted orifice **15** between the pump **11** and the gallery **12**.

My oil regulator collectively designated **16** is adapted to be situated transversely above the engine **10** and includes a vertically situated oil inlet manifold tube **18**. A plurality of spaced and parallel finned heat exchange tubes **19** are disposed in a vertical plane and are connected in parallel to the aforementioned inlet and return manifold tubes **17** and **18** and it will be noted that each finned heat exchange tube **19** is provided with a restricted orifice **20** adjacent the end of the tube connecting to the return manifold tube **18**.

An oil feed tube **21** extends between said oil delivery conduit **14** and the oil inlet manifold tube **17** and the point of connection **22** of this oil feed tube is situated between the pump **11** and the restricted orifice **15** within the conduit **14**.

An oil return tube **23** extends between the oil delivery conduit **14** and the oil return manifold tube **18** and the point of connection **24** of this tube is down stream of the restricted orifice **15** as clearly shown in FIGURE 1.

If desired a thermometer **25** may be connected to the conduit **23** so that the temperature of the return oil can be ascertained.

A by-pass tube **26** includes two vertically situated spaced and parallel legs **27** and **28**, being connected at the upper ends **29** thereof as clearly illustrated. The lower end of tube **28** is connected to the oil feed tube **21** and the lower end of the other leg **27** is connected to the oil return tube **23**.

The two legs **27** and **28** of the tube **26** are situated vertically and in contiguous relationship with each of the heat exchange tubes **19**, it being understood that the fins **30** are removed at this point of contact. Insulating material **31** surrounds the portions of the legs **27** and **28** and also the portions of the heat exchange tubes **19** where same are contiguous as illustrated in FIGURE 2 and it will be observed that the legs **27** and **28** contact the heat exchange tubes **19** adjacent the restricted orifices **20** thereof.

Finally it will be observed that I have provided a hermetically sealed air and oil receiver **32** connected to the upper end **33** of the return manifold **18** upstream from the connection of the heat exchange tubes **19** to the manifold **18**.

In operation, when the engine is started, oil is pumped by pump **11** through conduit **14** and, if the oil temperature is low, only a small portion of the oil will pass through the restriction **15**.

The majority of the oil will pass through conduit **21**, through the by-pass leg **28** and **27** back to conduit **23** whereupon it will be directed to the main gallery **12**.

As the temperature of the oil rises and it becomes less viscous, an increasing portion of the oil passes through the heat exchange tubes **19** and thence to the high pressure system thus lowering the temperature of the oil and maintaining same at the desired figure. The contiguous relationship of the legs **27** and **28** of the by-pass tube **26**, with the heat exchange tubes **19** assists in the heating of these tubes adjacent the restricted orifices **20** thereof in order to speed up the initial operation of the oil cooler and this heat transfer is, of course, facilitated by the insulation **31** surrounding the tubes at this point.

The fact that the upper ends **29** of the by-pass tube are situated above the cooling tubes **19** provides additional resistance to the oil so that when it is at the working temperature the path of least resistance of the oil is through the cooling tubes **19** rather than the by-pass tube **26** due to the additional pressure in this by-pass tube.

However, under certain circumstances there is not sufficient room to provide enough vertical length to the by-pass tubes to give sufficient restriction to the oil therewithin.

Under these circumstances, I add a pressure control valve collectively designated **34** which is situated within the by-pass tubes **27** and **28** adjacent the upper ends thereof where the upper ends join together.

This pressure relief valve comprises a casing **35** having an inlet **28'** connected to leg **28**, and an outlet **29'** connected to the junction area **29** of the by-pass tube.

A ball **36** engages a ball seating **37** above the inlet **28'**, said ball being retained in the area by means of a cage **38** which permits limited vertical movement of the ball from the seat **37**.

A control rod **39** is screw-threadably engageable within a shoulder **40** at the top of the casing **35** passing through gland **41** and the lower end of this control **39** terminates in flange **42** which limits the upper movement of the ball **36**.

A collar **43** surrounds the stem **39** and a cup **44** is freely mounted upon the stem between the fixed collar **43** and the end **42**.

A spring **45** reacts between the fixed collar **43** and the cup **44** and the lower side of the cup engages the ball **36** and applies pressure thereto.

Therefore, by manipulating the stem **39** by means of the knurled head **46**, the spring **45** is compressed thus controlling the pressure at which ball **36** will be lifted from the seat **37**.

When the engine is first started, any air situated within the system is forced into the air and oil receiver **32** where it is compressed to a pressure equal to the oil pressure of the system. When the engine ceases operation, the air in the receiver exhausts and purges the system of oil by driving same back towards the oil pump and bearings. It will be noted that portions **21'** and **23'** of the conduits **21** and **23** within the engine **10**, incline upwardly towards the points of connection with the conduit **14** and I have found that any air taken in by the pump (by low oil or other reasons) will discharge directly to the conduit **14** and through the bearings instead of to the oil cooler **16**.

Since various modifications can be made in my invention as hereinabove described, and many apparently widely different embodiments of same made within the spirit and scope of the claims without departing from such spirit and scope, it is intended that all matter contained in the accompanying specification shall be interpreted as illustrative only and not in a limiting sense.

What I claim as my invention is:

1. In a pressurized, lubricating system of an internal combustion engine, the combination of an oil pump having an oil delivery conduit provided intermediate the ends thereof with a restricted orifice, an oil temperature regulator comprising an oil inlet manifold, an oil return manifold, a plurality of mutually parallel finned heat exchange tubes extending between and connected to said inlet and return manifold, said heat exchange tubes being provided at the return manifold ends thereof with restricted oil passages, an oil feed tube extending to said inlet manifold from a point on said oil delivery conduit between said pump and said restricted orifice, an oil return tube extending from said return manifold to a point on said oil delivery conduit down stream from the restricted orifice, and an oil by-pass tube extending from said inlet manifold to said oil return tube in by-passing relation to said heat exchange tubes, said oil by-pass tube being disposed transversely to and in contiguous relationship with said heat exchange tubes adjacent the restricted oil passages thereof

for heat transfer from said oil by-pass tube to said heat exchange tubes, and insulating material surrounding and enclosing said oil return tube and said heat transfer tubes adjacent the contiguous relationship thereof.

2. The device according to claim **1** in which said oil feed tube and said oil return tube each includes an inclined portion within the engine adjacent the said points of connection of said tubes and slanting upwardly toward its point of connection with said oil delivery conduit thereby assisting in the purging of air of said system.

3. In a pressurized, lubricating system of an internal combustion engine, the combination of an oil pump having an oil delivery conduit provided intermediate the ends thereof with a restricted orifice, an oil temperature regulator comprising an oil inlet manifold, an oil return manifold, a plurality of mutually parallel finned heat exchange tubes extending between and connected to said inlet and return manifold, said heat exchange tubes being provided at the return manifold ends thereof with restricted oil passages, an oil feed tube extending to said inlet manifold from a point on said oil delivery conduit between said pump and said restricted orifice, an oil return tube extending from said return manifold to a point on said oil delivery conduit down stream from the restricted orifice, an oil by-pass tube extending from said inlet manifold to said oil return tube in by-passing relation to said heat exchange tubes, said oil by-pass tube including a pair of spaced and parallel vertically situated legs joined at the upper ends thereof, said legs being situated transversely to and in contiguous relationship with said heat exchange tubes adjacent the restricted oil passages thereof for heat transfer from said oil by-pass tube to said heat exchange tubes, a hermetically sealed receiver for air and oil connected to said return manifold upstream from the connection of said heat exchange tubes to the latter, insulating material surrounding and enclosing said oil return tube and said heat transfer tubes adjacent the contiguous relationship thereof.

4. The device according to claim **3** in which said oil feed tube and said oil return tube each include an inclined portion within the engine adjacent the said points of conection of said tubes and slanting upwardly toward its point of connection with said oil delivery conduit thereby assisting in the purging of air of said systems.

5. The device according to claim **3** which includes a manually adjustable pressure control valve in said oil by-pass tube adjacent the upper end of one of said legs thereof.

6. The device according to claim **4** which includes a manually adjustable pressure control valve in said oil by-pass tube adjacent the upper end of one of said legs thereof.

References Cited by the Examiner

UNITED STATES PATENTS

2,011,100	8/35	Woods	137—339 X
2,476,405	7/49	Dilworth	165—38
2,943,845	7/60	Jaklitsch	165—38

FOREIGN PATENTS

598,398	5/60	Canada.

ROBERT A. O'LEARY, *Primary Examiner.*

CHARLES SUKALO, *Examiner.*