

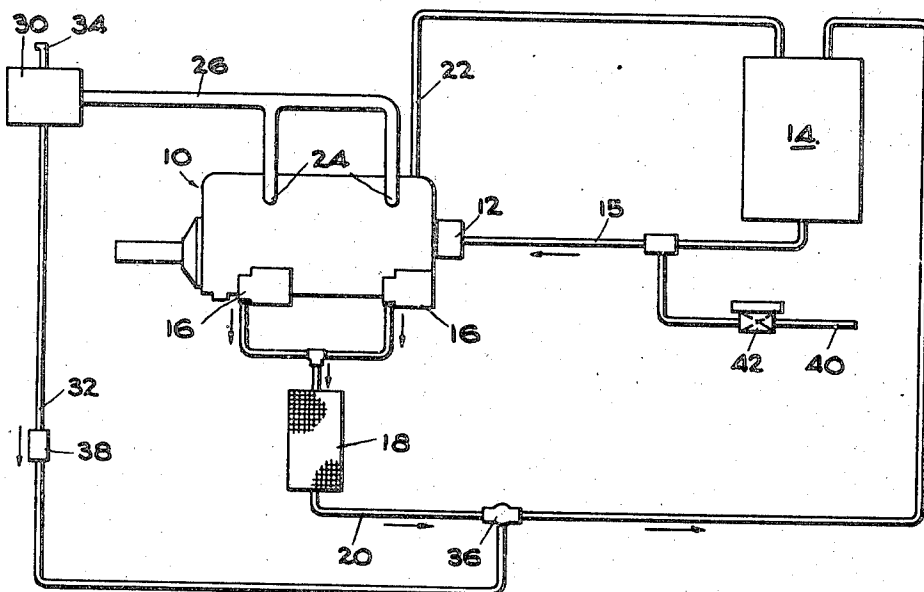
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J. F. STRICKLER, JR., ET AL

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ENGINE LUBRICATION SYSTEM

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INVENTORS
John F. Strickler Jr.
Stuart K. Edleson
BY

Bean, Brooks, Buckley & Bean, ATTORNEYS

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ENGINE LUBRICATION SYSTEM

John F. Strickler, Jr., Williamsville, and Stuart K. Edleson, Niagara Falls, N. Y., assignors to Bell Aircraft Corporation, Wheatfield, Niagara County, N. Y.

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This invention relates to internal combustion engines, and more particularly to improvements in engines having oil dilution systems wherein engine fuel or the like is used to dilute the engine lubricating oil in order to prevent excessive congealing of the engine oil under extreme cold weather operating conditions.

It has been proposed to dilute the lubricating oil content of an engine system with engine fuel such as gasoline, kerosene, or the like just prior to stopping the engine so as to prevent undue congealing of the oil within the system while the engine is idle under cold weather conditions. Otherwise it becomes extremely difficult or impossible to restart the engine without preheating. For example, an arrangement for the diluting engine oil for the above stated purpose is disclosed in Patent 2,373,142.

However, the adaptation of the above stated proposal to heavy duty engines under extreme cold weather operating conditions, such as for example in the case of military aircraft based in Arctic regions is impracticable in the absence of additional arrangements. For example, under such conditions it has been found necessary to provide for as much as 30% dilution in order to forestall excessive congealing of the engine oil supply. This means that the engine oil supply must be so diluted as to contain as much as 30% gasoline or other fuel or substance used for diluting purposes. Such a high degree of dilution satisfactorily solves the problem of permitting restarting of the engine except that it introduces a new problem in that immediately upon restarting of the engine the oil-fuel mixture tends to vaporize excessively in the engine crank case resulting in spewing of the oil and gasoline and vapor mixture out of the engine crank case breather openings. The discharge occurs at such rate that the engine oil supply is rapidly dissipated, thereby endangering the engine and rendering the oil dilution arrangement to be impracticable unless provision be made for reclaiming the oil components of the breather discharge as it occurs.

It is a primary object of the present invention to provide an improved engine oil dilution system which is operable to provide an increased degree of oil dilution while being in every sense practicable for the intended purpose. Another object of the invention is to provide an engine oil system embodying an oil dilution and recovery arrangement of novel form. Another object of the invention is to provide an improved oil dilution and recovery system which avoids the difficulties and

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disadvantages set forth hereinabove. Other objects and advantages of the invention will appear in the specification hereinafter.

In the drawing, the figure is a schematic illustration of an oil dilution and recovery arrangement of the invention in operative combination with an in-line-cylinder type aircraft engine.

The engine is designated at 10 as including an oil feed pressure pump 12 taking oil from a reservoir or tank 14 through a conduit 15. The engine 10 also includes, as is customary, a pair of scavenge pumps 16—16 which are employed to force the circulating oil through an air cooled radiator 18, and thus through a return line 20 into the oil reservoir 14. An air vent conduit 22 runs from the engine crank case into the upper end of the oil tank 14 for venting air or vapor in the upper end of the oil reservoir into the engine crank case. Engine crank case breather outlets 20 are indicated at 24—24 and connect into a manifold 26 which discharges into the feed end of a vapor-oil separator as indicated at 30.

The separator 30 may be of any suitable type and incorporates an oil discharge outlet 32 and an air vent conduit 34. The oil discharge conduit 32 connects into the suction port of an eductor 36 installed in the line of the conduit 20. Thus, it will be understood that the rush of oil through the conduit 20 from the pumps 16—16 toward the oil reservoir 14 will induce flow of oil from the separator 30 into the oil reservoir feed conduit 20 while vapor fractions of the separator feed will be vented through the conduit 34 externally of the aircraft. A check valve as indicated at 38 is installed in the line of the conduit 32 whereby to prevent reverse flow of oil from the conduit 20 through the conduit 32 and into the separator. Any means for permitting dilution of the engine oil may be employed such as a gasoline feed conduit 40 leading from a gasoline pump and discharging into the oil conduit 15. A valve is employed as at 42 for controlling the dilution operation, and it will be understood that the valve 42 may be remotely controlled from the pilot cockpit by an electrical circuit and solenoid device, or the like.

As stated hereinabove, any suitable type of oil separator may be employed at the position designated 30, and any suitable type of ejector device may be employed at the position designated 36, such as a Venturi throat type injector or an electrical or engine driven pump, or the like. In event the rate of flow through the conduit 20 reduces, as in response to opening the engine throttle, to such degree as to render the eductor

36 ineffective, the check valve 38 will operate to prevent the engine discharge oil from flowing through the conduit 32 into the separator 30.

Therefore, it will be understood that the invention provides an arrangement which permits dilution of the engine oil to any desired degree because the oil is subsequently completely recovered from the diluted mixture due to effective operation of the eductor device resulting in restoration of the reclaimed oil into the engine lubricating system. It will of course be appreciated that the invention may be initially built into any engine mechanism as an integral part thereof, or a system of the invention may be added to a previously built engine as an accessory thereto.

It will also be understood that although only one form of the apparatus and possible application of the invention has been illustrated and described in detail, the invention is not limited thereto and may be employed in other installations and may be altered as to structural form and details of arrangements without departing from the spirit of the invention or the scope of the appended claims.

What is claimed is:

1. An internal combustion engine lubrication system, comprising in combination, an engine casing, a first conduit leading from said casing, a pump in operative communication with said first conduit for inducing flow of oil therethrough away from said casing, an oil cooling radiator connected to said first conduit for cooling the oil passing therethrough, a second conduit leading from said radiator to convey oil discharged therefrom, an oil supply tank having an inlet port connected to said second conduit, a third conduit coupled to said oil supply tank and to said engine casing for conveying oil from said tank into said casing, a second pump device connected to said third conduit and operable to displace oil therethrough whereby the engine casing oil may be continuously withdrawn and circulated through said radiator and said tank and returned to said casing, a fourth conduit arranged to convey under pressure a liquid diluent for said engine casing oil supply and connected to said third conduit, a vent conduit interconnecting said engine casing and said oil supply tank for venting vapor from the oil supply tank into the engine casing, said engine casing having a breather outlet port and a fifth conduit connected thereto for carrying oil-containing vapors from the engine casing, an oil separator connected to said fifth conduit and having a separated air discharge port and a recovered oil discharge port, a sixth conduit connected to said recovered oil port and connected to a check valve permitting displacement of oil through said sixth conduit only in a direction leading away from said separator, and an eductor connected into said second conduit and having its induction intake port coupled to said sixth conduit and so arranged that displacement of oil through said second conduit in the direction of said oil supply tank induces addition thereto of oil recovered from said separator.

2. An internal combustion engine lubrication system, comprising in combination, an engine crank case, a first conduit leading from said crank case, a pump in operative communication with said first conduit for inducing flow of oil therethrough away from said crank case, an oil supply tank having an inlet port connected to said first conduit, a second conduit coupled to

said oil supply tank and to said engine crank case for conveying oil from said tank into said crank case, a second pump device connected to said second conduit and operable to displace oil therethrough whereby the engine crank case oil may be continuously withdrawn and circulated through said radiator and said tank and returned to said crank case, a third conduit arranged to convey under pressure a liquid diluent for said engine crank case oil supply and connected to said second conduit, an air vent conduit interconnecting said engine crank case and said oil supply tank for venting vapor from the oil supply tank into the engine crank case, said engine crank case having a breather outlet port and a fourth conduit connected thereto for carrying oil containing vapors from the engine crank case, an oil separator connected to said fourth conduit and having a separated air discharge port and a recovered oil discharge port, a fifth conduit connected to said recovered oil port and connected to a check valve permitting displacement of oil through said fifth conduit only in a direction leading away from said separator, and an eductor connected into said first conduit and having its induction intake port coupled to said fifth conduit and so arranged that displacement of oil through said first conduit in the direction of said oil supply tank induces addition thereto of oil recovered from said separator.

3. An internal combustion engine lubrication system, comprising in combination, an engine crank case, a first conduit leading from said crank case, a pump in operative communication with said first conduit for inducing flow of oil therethrough away from said crank case, an oil cooling radiator connected to said first conduit for cooling the oil passing therethrough, a second conduit leading from said radiator to convey oil discharged therefrom, an oil supply tank having an inlet port connected to said second conduit, a third conduit coupled to said oil supply tank and to said engine crank case for conveying oil from said tank into said crank case, a second pump device connected to said third conduit and operable to displace oil therethrough whereby the engine crank case oil may be continuously withdrawn and circulated through said radiator and said tank and returned to said crank case, means arranged to convey under pressure a liquid diluent for said engine crank case oil supply and connected to said engine crank case, said engine crank case having a breather outlet port and a fourth conduit connected thereto for carrying oil containing vapors from the engine crank case, an oil separator connected to said fourth conduit and having a separated air discharge port and a recovered oil discharge port, a fifth conduit connected to said recovered oil port and connected to a check valve permitting displacement of oil through said fifth conduit only in a direction leading away from said separator, and an eductor connected into said second conduit and having its induction intake port coupled to said fifth conduit and so arranged that displacement of oil through said second conduit in the direction of said oil supply tank induces addition thereto of oil recovered from said separator.

4. An engine lubricating system, comprising in combination, an engine crank case, a pump in operative communication with said crank case for inducing flow of oil from said crank case, an oil reservoir tank, a first conduit coupled to said oil reservoir tank and to said engine crank case for

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returning oil from said tank into said crank case, a second conduit intercommunicating the discharge port of said pump and said reservoir tank whereby the engine crank case oil may be continuously withdrawn and circulated through said tank and returned to said crank case, means arranged to convey under pressure a liquid diluent into said engine crank case oil supply, a third vent conduit interconnecting said engine crank case and said oil reservoir tank for venting vapor from the oil reservoir tank into the engine crank case, said engine crank case having a breather outlet, an oil separator connected to said breather outlet and having a separated vapor discharge and a recovered oil discharge port, a fourth conduit connected to said recovered oil port and having a check valve therein permitting displacement of oil through said fourth conduit only in a direction leading away from said separator, and an eductor in the line of said second conduit and having its induction intake port coupled to said fourth conduit and so arranged that displacement of oil from the crank case in the direction of said oil reservoir tank induces addition thereto of oil recovered from said separator.

5. An engine lubricating system, comprising in combination, an engine crank case, a pump in operative communication with said crank case for inducing flow of oil from said crank case, an oil cooling radiator connected to said pump for cooling the oil passing therethrough, an oil reservoir tank, first conduit means coupled to said oil reservoir tank and to said engine crank case for conveying oil from said tank into said crank case, a second conduit intercommunicating the discharge

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port of said radiator and said reservoir tank whereby the engine crank case oil may be continuously withdrawn and circulated through said radiator and said tank and returned to said crank case, means arranged to convey under pressure a liquid diluent for said engine crank case oil supply, said engine crank case having a breather outlet for carrying oil-containing vapors from the engine crank case, an oil separator connected to said breather outlet and having a separated vapor discharge port and a recovered oil discharge port, a recovered oil conduit connected to said recovered oil port and having a check valve therein permitting displacement of oil through said recovered oil conduit only in a direction leading away from said separator, and an eductor connected in the line of said second conduit and having its induction intake port coupled to said recovered oil conduit and so arranged that displacement of oil from the crank case in the direction of said oil reservoir tank induces addition thereto of oil recovered from said separator.

JOHN F. STRICKLER, JR.
STUART K. EDLESON.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,728,268	Flanders	Sept. 17, 1939
2,188,801	Worth	Jan. 30, 1940
2,385,522	Malott	Sept. 25, 1945