United States Patent

Stenger

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[54] **OIL DISTRIBUTION SYSTEM**

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[51] **Int. Cl.**.....**F16n 1/00,** F01p 3/02

[58] **Field of Search**.....184/6.8, 18, 6, 6.24, 6.16, 184/24, 6.28; 123/196 M, 41.72, 41.42, 41.79, 41.81; 92/144

[56] **References Cited**

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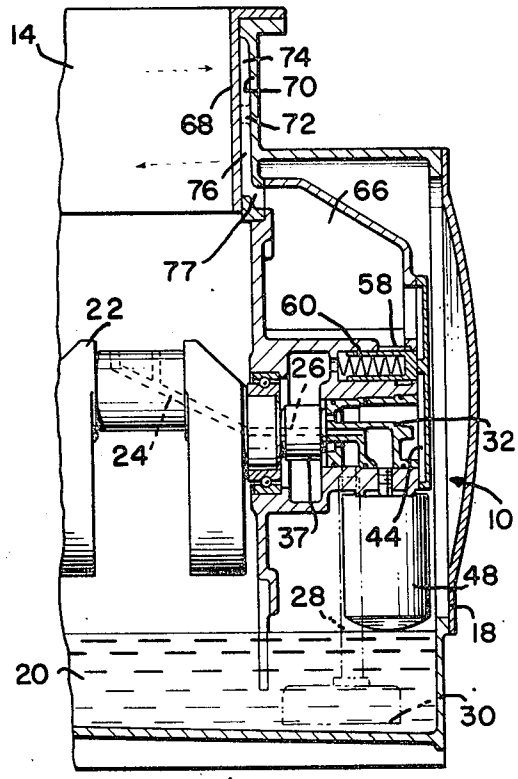
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[57] **ABSTRACT**

The system incorporates a cylinder which has chambering in the wall thereof and has conduits for conducting that oil, which is in excess of the quantity required for lubrication of the machine of which the cylinder is a part, into the chambers for dispersing incident cylinder heat throughout the cylinder.

6 Claims, 3 Drawing Figures



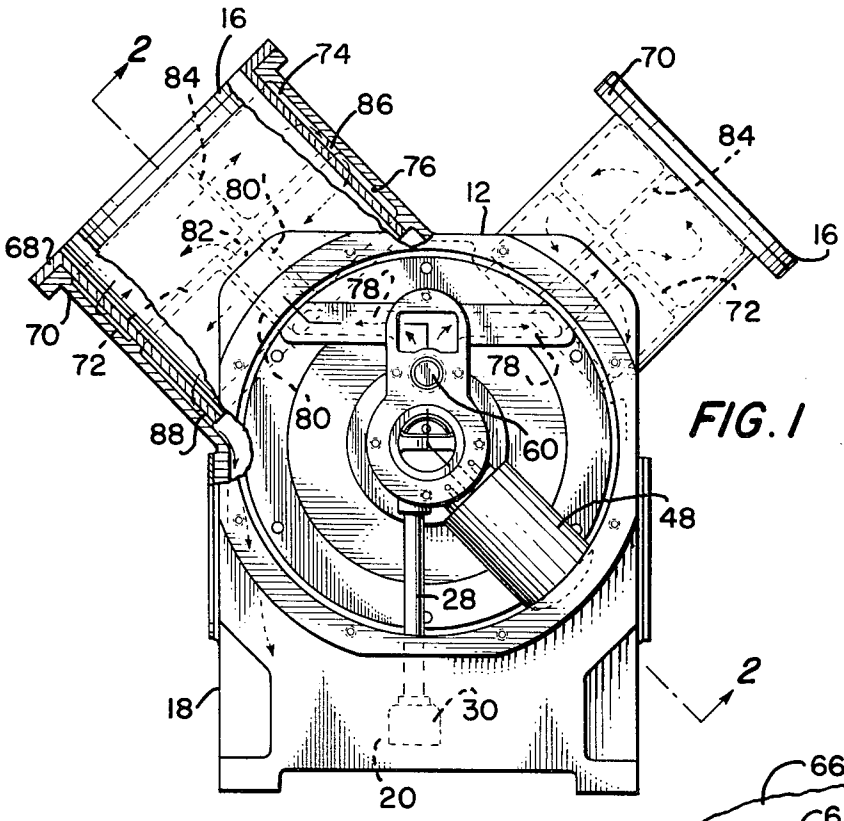


FIG. 1

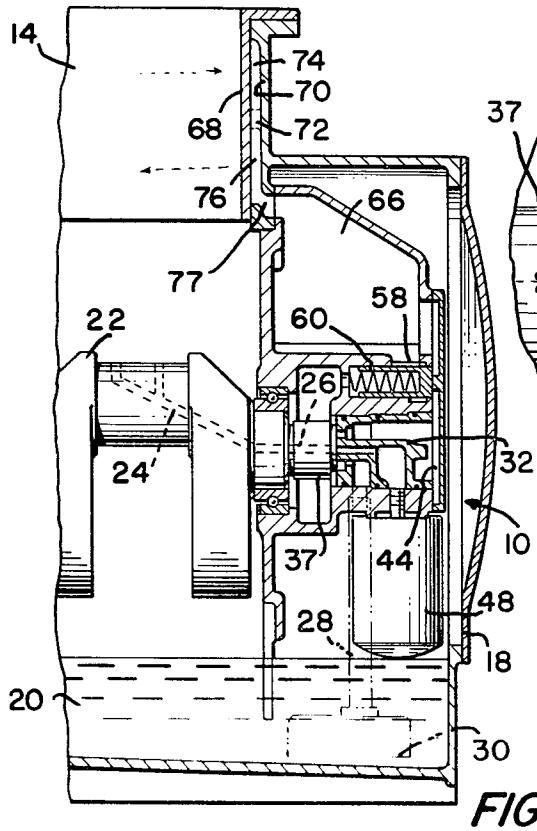
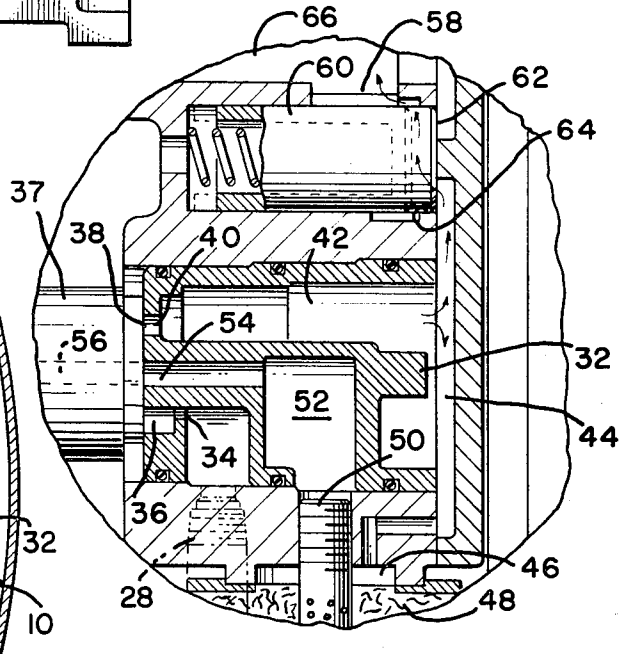


FIG. 2

FIG. 3



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OIL DISTRIBUTION SYSTEM

This invention pertains to an oil distribution system and method for use in a machine housing or frame which incorporates a cylinder disposed to accommodate a reciprocable piston therewithin and in particular to such a system and method for dispersing incident cylinder heat throughout the cylinder.

In the prior art it is customary to pump oil which is required for lubrication of relatively movable components of a machine to two passages, one of which passages communicates with a valve, set at a predetermined pressure, to insure the passage of the requisite quantity of lube oil therethrough for lubrication of the machine components. The other passage customarily returns the excess oil to the crankcase or sump.

It is also known in the prior art, from the teaching of U.S. Pat. No. 2,085,810, issued to F. Ljungstrom, 6 July 1937, for "Cooling of Internal Combustion Engines" and No. 3,127,870, issued to D. Giacosa, et al., 7 Apr. 1964, for "Cooling Cylinder Liners of Internal Combustion Engines", to use crank case oil for conduct thereof through cylinder jackets. However, these patents are directed to cylinder cooling and, as they teach the use of oil as the cooling medium, the cooling effect is notably inefficient. For this reason the patents cited incorporate cooling apparatus, to reduce the oil temperature, efficiently to cool the cylinder. Such system, therefore are, rather complex and require a considerable amount of extraneous and external (relative to the machine frame) piping and conduits.

It is an object of this invention to teach a system in which the excess oil is pumped, without complex cooling apparatus, to the cylinders to effect a dispersal of incident cylinder heat to insure that the cylinders will not become deformed and go out-of-round.

It is another object of this invention to teach an oil distribution system for dispersing incident cylinder heat throughout the cylinder, for use in a machine frame having a cylinder disposed to accommodate a reciprocable piston therewithin, comprising a cylinder liner, and a cylinder jacket enveloping the liner, wherein the liner and jacket cooperate to define at least one chamber therebetween, an oil reservoir within the frame, and means wholly confined and fixed within the frame for conducting oil from the reservoir to the cylinder chamber.

Another object of this invention is to set forth, in a machine frame incorporating a walled cylinder disposed to accommodate a reciprocable piston therewithin, an oil distribution system for dispersing incident cylinder heat throughout the cylinder, comprising means defining at least one supply of oil and means wholly confined with the frame for conducting oil from the supply into the chamber.

It is yet another object of this invention to disclose a method of dispersing incident cylinder heat throughout a walled cylinder fixed to the frame of a machine and disposed to accommodate a reciprocable piston therein, comprising a chambering of the cylinder wall by forming at least one circumferential chamber therewithin, confining a supply of oil within the frame, forming a line of contiguous oil-conductive passageways wholly within the frame which opens at either ends on the oil supply and the one chamber, and forcing oil along the line from the supply into the one chamber.

A feature of this invention comprises a cylinder formed of a jacket enveloping a liner, with chambers therebetween, and conduits for conducting crankcase oil, in excess of that required for machine lubrication, into the chambers to effect a dispersal of incident cylinder heat throughout the cylinder.

Further objects and features of this invention will become more apparent by reference to the following description taken in conjunction with the accompanying figures, in which:

FIG. 1 is an end view, partly in section, of a machine frame, incorporating the novel oil distribution system, the frame and its confined components comprising an air compressor; and end cover is removed from the frame, in this view, to facilitate observation of some of the system elements;

FIG. 2 is a vertical cross-section of the frame and system, taken along section 2—2 of FIG. 1; and

FIG. 3 is a view of the more pertinent area of the FIG. 2 cross-section, the view being enlarged over the scale of FIG. 2.

As shown in the Figures, the system **10**, according to the invention, is shown in a machine frame **12**, the machine depicted, only by way of example, comprises an air compressor **14**. The frame **12** comprises a pair of spaced-apart cylinders **16** mounted on top of a crankcase housing **18**, and has a crankcase or oil sump **20** in the bottom thereof. Housing **18** supports and confines a crankshaft **22** which has lube oil passageways **24** formed therein for communication of oil therethrough to connecting rod bearings and relatively movable parts of the machine, all of which require lubrication. Passageways **24** communicate, via one end of crankshaft **22**, with a crankshaft lube oil inlet opening **26**.

The system comprises an oil intake pipe **28**, one end of which is submerged in the oil reservoir supply in sump **20**, and which has a filter screen **30** in the lower end thereof. Pipe **28**, at the other end thereof, communicates with a casting **32**; casting **32** has an oil outlet port **34** formed therein in communication with a pump oil inlet **36**. Accordingly, by pump suction, lube oil is drawn from sump **20**, screened, and passed through pipe **28**, through port **34** and supplied to the pump **37**. The pump has an oil outlet **38** which forms an interface with an oil outlet port **40** formed in the casting from which the pressured oil is conducted through a channel **42**, formed in the casting, for passage along a first frame-walled passageway **44**.

From passageway **44** the screened, pressured oil is communicated through an inlet **46** of a filter **48**, passes through a filter outlet **50** into a cored passageway **52** formed in the casting. Finally, the filtered lube oil is conducted through oil outlet **54** in the casting, and passed through a borehole **56** in the pump **37** for communication with the crankshaft lube oil inlet opening **26**.

While different pumps of equivalent structure and/or function can be used, the pump **37** depicted in this embodiment is one of the "TRS Series" models of lubricating pump manufactured by Sundstrand Hydraulics, Division of Sunstrand Corporation, 2210 Harrison Avenue, Rockford, Ill. 61101.

The frame **12** defines a second, frame-walled passageway **58** which is communicated with, or cut off

from, passageway 44 by a pressure-responsive check valve 60. Valve 60 has a valving surface 62 which cooperates with a valve bore 64 to interdict and to accommodate the passage of pressured oil from passageway 44 to passageway 58. Thus far, the system disclosed is not significantly different from known oil distribution systems. It would be customary at this juncture, according to prior art teaching, to have any excess oil, i.e., that quantity which is conducted into the passageway 58, returned to the sump 20. However, this invention teaches the use of the excess oil for dispersing incident cylinder heat throughout all of the cylinder metal. Accordingly, the frame 12 comprises an excess oil plenum or repository 66. Valve 60, then, controls the admittance of excess oil into plenum 66 for conduct of the oil therefrom to the cylinders 16.

Each cylinder comprises a liner 68 and an enveloping jacket 70, the jacket having integral therewith a circumferential rib 72 which engages, and therefore cooperates with the outer surface of the liner 70 to define, to either sides of the rib 72, first and second separate chambers 74 and 76, respectively. In a novel way, my invention teaches initial conduct of the oil to uppermost or first chamber 74, and then to chamber 76 before return thereof to the sump 20.

Plenum 66 opens on a central access port 77 of a double-ended, oil supply passageway 78, formed in the frame 12. The ends of passageway 78 communicate, individually, with the two cylinders 16. Typically, one end of passageway 78 conducts oil, to the cylinder associated therewith, by conveying it between parallel ribs 80 and 80' which are integral with jacket 70, and extend to, and are in sealing contact with, liner 68. Ribs 80 and 80' cooperate with liner and jacket surfaces to define a cylinder inlet passageway 82 which opens on chamber 74.

On entry to cylinder chamber 74 the oil must conduct 80' the chamber in one given direction because of a wall 84 integral with and projecting from jacket 70, in contact with the surface of liner 68, which prohibits conductance of the oil thereat. On filling chamber 74, and passing therethrough, the oil is drained through an inter-chamber conduit 86 from which it passes into second chamber 76; here the oil is conducted through chamber 76 in the opposite or counter direction. The inter-chamber conduit 86 is defined by a discontinuous portion—an interruption—of rib 72. It provides the only fluid access between chambers 74 and 76. Rib 80' of passageway 82 functions in the same manner as does wall 84; thus, rib 80' obstructs oil flow and requires the oil to pass through the second chamber 76 in the counter direction. Thereafter, a drain hole 88 formed of a discontinuous portion of a flange of jacket 70, in the bottom of chamber 76, permits the oil to drain therethrough and return to the sump.

It is to be borne in mind that it is not the teaching of this invention to cool the cylinder jackets. Especially in the application embodied herein, it is less important (in an air compressor, for instance) to insure cooling so much as it is important to insure that the cylinder has any incident hot spots eliminated, and the cylinder heat dispersed throughout the cylinder metal. The invention, as exemplified in the embodiment disclosed herein, is addressed to the dispersal of cylinder heat, and novelly teaches this function.

Another benefit provided by this invention, which the disclosed embodiment evidences, is the control and dissipation of condensation in the oil which condensation will collect when the machine is subject to light duty. The heating of the lube oil, through its use in the cylinder chambers 74 and 76, drives off any water vapor which might become admixed therein. So also, a more uniform viscosity of the lube oil proceeds from the practice of this invention.

The novel heat dispersal method which I teach herein is shown practiced with cylinders 16 comprising liners 68 and enveloping jackets 70. However, my method contemplates any step which defines or forms at least one circumferential chamber within the cylinder wall.

Both the novel method, and the system, utilize a contiguous line of oil-conductive passageways which are wholly within the frame 12, to communicate oil into the chambers 74 and 76 from the frame-confined sump 20. This is an especially novel advantage over prior art teaching as known from the U.S. Pat. No. 2,085,810 and No. 3,127,879 (earlier cited). My teaching completely obviates any need for externalized piping and conduits. In the prior art, piping and conduits external to the frame are necessitated to accommodate for cooling, as cylinder cooling, in contract to my teaching, is the object of such prior art.

While I have described my invention in connection with a specific embodiment thereof, it is to be clearly understood that this is done only by way of example and not as a limitation to the scope of my invention as set forth in the objects thereof and in the appended claims.

I claim:

1. In a machine frame incorporating a cylinder disposed to accommodate a reciprocable piston therewithin, an oil distribution system for dispersing incident cylinder heat throughout the cylinder, comprising:

a cylinder liner;

a cylinder jacket enveloping said liner and fixed to the frame;

said liner and jacket having means cooperatively defining at least one chamber therebetween;

an oil reservoir within said frame; and

given means wholly confined and fixed within said frame for conducting oil from said reservoir into said one chamber; wherein

said given oil conducting means includes an oil pump, mounted within said frame, operatively interposed between said one chamber and said reservoir for supplying reservoir oil under pressure to said one chamber;

said liner and jacket have means cooperative to define a plurality of chambers therebetween, and a cylinder inlet passageway opening at one end thereof on one chamber of said plurality of chambers;

said given oil conducting means further includes means interposed between said cylinder inlet passageway and said pump, for communicating, and for interrupting a communication between, the other end of said cylinder inlet passageway and said pump;

said communication/interrupting means includes valving means, mounted within said frame, normally operative to interrupt said communication;

said valving means being operative in response to a predetermined oil pressure conducted thereto by said pump to accommodate communication between said other end and said pump to admit oil to said one chamber; and

said chambers-defining means comprises a partitioning rib integral with said jacket and projecting therefrom in contacting engagement with said liner, said partitioning rib cooperating with liner and jacket surfaces to define separate chambers to opposite sides thereof.

2. A system according to claim 1, wherein:

said partitioning rib has at least one discontinuous portion, said one portion cooperating with said liner and jacket surfaces to define an inter-chamber conduit for the passage of oil therethrough from one of said rib-defined separate chambers to another separate chamber adjacent thereto.

3. A system, according to claim 2, wherein:

said jacket has wall means integral therewith and projecting therefrom in contacting engagement with said liner, said wall means cooperating with liner and jacket surfaces to obstruct oil conduction thereat;

said pump and said wall means, together with said surfaces, being cooperative to force oil to be conducted through at least one of said separate chambers in a given direction.

4. A system, according to claim 3, wherein:

said cylinder inlet passageway cooperates with said liner and jacket surfaces to force oil to be conducted through at least another separate chamber in a direction which is counter to said given direction.

5. A system, according to claim 1, wherein:

said given oil conducting means includes other means for conducting oil from said reservoir also to movable components within said frame for lubrication of said components.

6. A system, according to claim 5, wherein:

said other means includes filtering means operatively interposed between said movable components and said reservoir for filtering oil conducted from said reservoir to said movable components.

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