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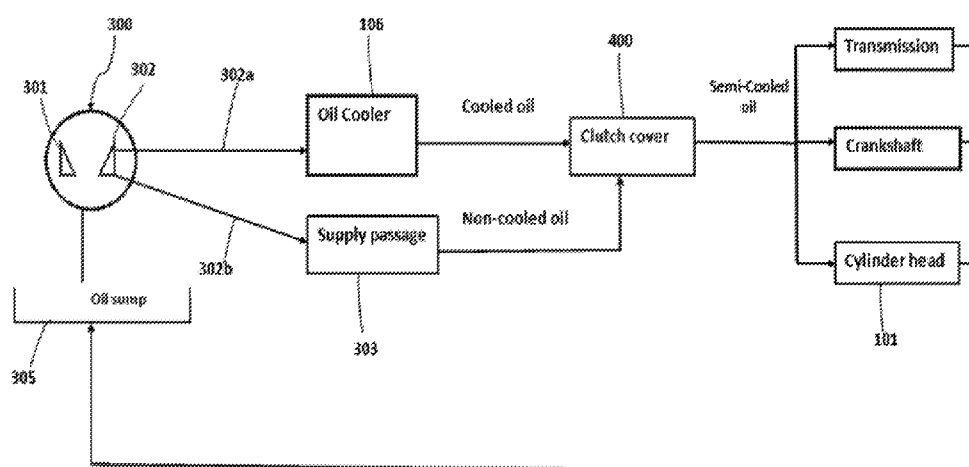


Fig.7a

(57) Abstract: The present invention relates to a lubrication system (100a) for an internal combustion engine (100) comprising a crankcase (200), an oil sump (305) formed at a bottom of the crankcase (200), an oil pump (300) including an inlet port (301) and a discharge port (302), and a supply chamber (401) including a first introduction port (401a) and a second introduction port (401b) wherein said discharge port (302) is configured to dispense said lubricating oil into at least one oil path (302a), (302b) including a first oil path (302a) and a second oil path (302b). The first oil path (302a) in communication with an oil cooler (106) supplies cooled oil to the supply chamber (401) through said first introduction port (401a) and said second oil path (302b) in communication with at least one supply passage (303) supplies non-cooled oil to the supply chamber (401) through said second introduction port (401b). A semi-cooled oil formed by introduction of said cooled and said non-cooled oil into said supply chamber (401) is circulated to the

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LUBRICATION SYSTEM FOR A TWO-WHEELED VEHICLE

FIELD OF INVENTION

[0001] The present invention relates to a two-wheeled vehicle. More particularly, the present invention relates to a lubrication system for the vehicle.

5

BACKGROUND

[0002] All internal combustion engines are equipped with an internal lubricating system to deliver clean oil at the correct temperature and pressure to every part of the engine. Without lubrication, an engine quickly overheats and its working parts seize due to excessive friction. All moving parts must be adequately lubricated to assure minimum wear and long engine life. Oil lubrication provides a barrier between rotating engine parts to prevent damage by friction and heat which can otherwise result in huge maintenance costs.

[0003] Generally, for a high capacity engines, as the power of vehicle increases, oil temperature shoots up. This necessitates use of external means to cool the lubricating oil to avoid deterioration in oil properties which can have cascading effects and leads to engine failure. For this purpose heat exchanger as oil cooler is used for maintaining the oil temperature below a desired maximum operating limit. The cooled oil is circulated to replace the oil that is warmed and expelled from the various moving parts due to the heat emanating from the lubricated surfaces. If the oil is overheated, the oil viscosity becomes very low and the oil breaks down thereby allowing metal-to-metal contact between the moving parts and surfaces. Further, when the engine is cold such as during a cold start, the oil is cold and the viscosity is high, the oil pressure provided by the oil pump is highest. However, this high oil pressure is not desired nor is beneficial. The high viscosity and the temperatures of the cold oil makes it unnecessary for the oil pump to circulate much oil. Secondly, the oil pressure exerted by the oil pump provides resistance to the cranking of the engine during start up which provides an unnecessary power drain on the battery, lower cranking speeds and increased fuel consumption during cold operation. For this reason, all engines

with the oil cooler uses a pressure relief valve to control oil pressure in the lubrication system in order to avoid leakage from & damage to cooling system parts due to high oil pressure or when oil temperature is low.

BRIEF DESCRIPTION OF THE DRAWINGS

5 [0004] The detailed description is described with reference to the accompanying figures. The same numbers are used throughout the drawings to reference like features and components.

[0005] Fig. 1. shows a side view of a two-wheeled vehicle according to one embodiment of a present invention.

10 [0006] Fig. 2. shows a perspective view of the internal combustion engine illustrating a cylinder head, cylinder block and a crankcase as per one embodiment of the present invention.

[0007] Fig. 3 shows a perspective view of the internal combustion engine with an oil cooler and the crankcase as per one embodiment of the present invention.
15

[0008] Fig. 4 shows a rear surface of a right crankcase illustrating an oil pump and position of at least one oil path according to one embodiment of the present invention.

[0009] Fig. 5 illustrates an enlarged plan view of the oil pump illustrating said at least one oil path and at least one supply passage as per one embodiment of the present invention
20

[00010] Fig. 6 is a partial sectional view taken in a longitudinal direction of the crankcase illustrating said at least one oil path including a first oil path and a second oil path, as per one embodiment of the present invention.

25 [00011] Fig. 7 shows a perspective view of a front surface of a clutch cover illustrating a supply chamber and position of a first introduction port and a second introduction port thereon.

[00012] Fig. 7a shows a flow diagram of the lubrication system as per one embodiment of the present invention.

[00013] Fig. 8 is a perspective view of a rear surface of the clutch cover illustrating at least one oil receiving passage for receiving said non-cooled oil from the rear surface of the crankcase, as per one embodiment of the present invention.

DETAILED DESCRIPTION

[00014] Typically, internal combustion engines are equipped with a lubricating system to promote efficient operation and performance. The lubrication system provides sufficient quantity of cooled and filtered oil to respective components of the engine to be lubricated. The oil lubricates moving parts to minimize wear by sealing the clearances between moving parts such as bearings, shafts, pistons, gears, etc. Thus, the parts moves on layers of oil, and not in direct contact with each other, which reduces power loss in the engine. Therefore, the oil performs the function of a cooling agent.

[00015] Generally, for engines with an oil cooler, a pressure relief valve is required to control maximum lubricant pressure permitted in the system. The oil pressure and temperature is controlled by the valve responsive to the difference in pressure existing at the inlet and outlet sides of the oil conditioning means.

[00016] In a known lubrication system, the pressure relief valve is mounted in the engine crankcase or clutch cover connected directly with the main oil gallery to provide mounting. The use of oil relief valves allows the escape of oil into an oil sump when internal oil pressure reaches a set level so as to maintain the system at constant pressure. Generally, the lubricating oil is accumulated and stored in the engine's oil sump where the oil pump pumps the lubricating oil through an oil filter to the parts of the engine needs to be lubricated. The oil filter cleans the oil and remove any metal that the oil has picked up due to wear. The cleaned oil then flows up into the engine's oil galleries. The pressure relief valve(s) maintains oil pressure in the galleries and returns oil to the oil pan upon

high pressure. The oil galleries distribute the oil to all the moving parts in the engine.

[00017] In an existing lubrication circuit for an internal combustion engine, when the engine is cold, the oil becomes cold and thick. The pressure relief valve
5 allows the oil to flow directly to the lubricating parts from the oil pump. As the engine heats up, the oil becomes thinner and hot.

[00018] In another known lubrication system for the internal combustion engine, an oil relief valve is arranged in a space located between one outside surface of the left and right of a crank case and the inside surface of a clutch cover
10 and surrounded by a crankshaft so as to relieve the pump outlet pressure when said pressure tends to exceed a predetermined high value.

[00019] However, the disadvantage associated with the above existing lubrication systems using the pressure relief valve is the increase in the number of parts, thereby requiring more space for accommodating the valve and hence
15 overall increasing the cost of implementing the pressure relief valve in the lubrication system.

[00020] In order to overcome the drawbacks by the above explained lubricating systems, another known art for the engine lubrication system eliminates the use of the pressure relief valve by involving a lubrication structure
20 comprising of a supply passage leading from the oil discharge port of the oil pump and further being branched into non-cooling and cooling passage. However, in such type of lubrication structure, the cooled oil through the cooling passage is circulated only to the crankshaft and other lubricating parts are supplied with non-cooled oil. Thus, the engine lubricating system where the crankshaft, cylinder
25 head and other lubricating parts of the engine requires to be oil cooled at correct temperature and pressure, the existing lubrication structure cannot be implemented.

[00021] However, the disadvantage with this lubricating structure is that, though the number of the components is reduced with eliminating the use of the

pressure oil relief valve, the cooled oil is only circulated to the crankshaft, and other lubricating parts of the engine receives non-cooled oil. Thus, said known lubricating system cannot be used to the engine where the cylinder head, transmission and crankshaft are oil cooled, and the bigger oil cooler is required for
5 supplying the lubricating oil at an optimum temperature to extract more heat from the respective engine parts to be lubricated so that the engine can run more efficiently.

[00022] With the above objectives in view, the present invention discloses an improved lubrication system for the internal combustion engine for controlling the
10 pressure and temperature of the lubricating oil and supplying semi-cooled oil to the respective engine parts to be lubricated without the use of the pressure relief valve.

[00023] Referring to one embodiment, the present invention provides an improved lubrication system which can effectively overcome the drawbacks
15 encountered in the conventional lubricating oil systems for the internal combustion engine and in parallel controls the pressure of the oil without the use of the pressure relief valve.

[00024] As per one embodiment, the engine lubrication system for the vehicle includes a lubricating oil storage section as an oil sump for storing lubricating oil,
20 an oil pump, an oil filter, the oil passages and respective oil paths and an oil pump for supplying lubricating oil in said oil sump to a plurality of portions of the engine requiring lubrication. The oil pump is driven by the internal combustion engine to suck the lubricating oil from the lubricating oil storage section and discharge the lubricating oil to the discharge passages and respective oil paths.
25 From the lubricating oil storage section that is the oil sump, the lubricating oil is distributed throughout the engine parts to be lubricated. In one embodiment, the parts to be lubricated and cooled includes the crankshaft, main bearings and other engine parts to be lubricated.

[00025] Referring to one embodiment, the present invention discloses the
30 lubrication system for the engine comprising the crankcase, the oil sump formed

at a bottom of the crankcase and the oil pump supplying lubricating oil from said oil sump to respective lubricating parts of the engine. As per one embodiment, the oil pump includes an inlet port, a discharge port and a supply chamber set between the oil pump and said respective engine parts to be lubricated. The supply
5 chamber includes a first introduction port and a second introduction port. According to one embodiment of the present invention, said discharge port is configured to dispense said lubricating oil into at least one oil path including a first oil path and a second oil path. The first oil path in communication with an oil cooler supplies cooled oil to the supply chamber through said first introduction
10 port and the second oil path in communication with at least one supply passage supplies non-cooled oil to the supply chamber through said second introduction port. Further, as per one embodiment of the present invention, a semi-cooled oil formed by introduction of said cooled and said non-cooled oil into said supply chamber is circulated to the respective lubricating parts of the engine through an
15 oil distribution port.

[00026] The present invention discloses an improved lubrication system for the engine to achieve the function of the pressure relief valve without actually using said valve. As per one embodiment of the present invention, the discharge port of the oil pump pumps out the lubricating oil into said at least one path
20 including the first oil path and the second oil path. The first oil path and the second oil path formed at the oil pump discharge port controls the oil pressure in different oil supplying passages supplying oil in different lubricating parts of the engine. According to one embodiment of the present invention, the first oil path formed at the oil discharge pump for supplying oil to the supply chamber via a oil
25 cooler may have diameter greater, smaller or equal to the second oil path formed at discharge port to drive the lubricating oil directly from the discharge port to a clutch cover through an opening. The clutch cover is coupled to the crankcase of the engine. According to one embodiment, the cooled oil from the first oil path via the oil cooler is introduced into the supply chamber through the first introduction
30 port and the non-cooled oil through the second introduction port. Thus, the cooled

oil and the non-cooled oil are mixed together forming a semi-cooled and thereafter branched to different portions of engine for lubrication and cooling.

[00027] With one embodiment of the present invention, the discharge port of the oil pump is having structure configured to pump and dispense said lubricating oil into said at least one oil path. The discharge port is having a structure with at least one opening including a first opening and a second opening. The first opening leads to said first oil path and said second opening leads to second oil path. Thus, pumping action of the lubricating oil is from the discharge port itself.

[00028] Further, as per one embodiment of the present invention, a bypassing route constituting the second oil path leading from at least one of the openings of the discharge port facilitates in the faster supply of the lubricating oil to the respective engine parts to be lubricated. That is, bypassing results in reducing the amount of time required for the lubricating oil to reach the respective engine parts to be lubricated and hence the bypassing has the advantage that the lubricating oil reaches more quickly to the engine parts to be lubricated.

[00029] Additionally, the oil cooler as per one embodiment of the present invention, is a bigger oil cooler as the supplying of the semi-cooled oil from the supply chamber to the cylinder head and the transmission requires bigger oil cooler, hence even if the pressure relief valve of the engine fails or being eliminated, the engine will not be running without oil.

[00030] Various other features and advantages of the invention are described in detail below with reference to the accompanying drawings. In the drawings, like reference numbers generally indicate identical, functionally similar, and/or structurally similar elements. The drawing in which an element first appears is indicated by the leftmost digit(s) in the corresponding reference number. With reference to the accompanying drawings, wherein the same reference numerals will be used to identify the same or similar elements throughout the several views. It should be noted that the drawings should be viewed in the direction of orientation of the reference numerals.

[00031] Further "front" and "rear", and "left" and "right" referred to in the ensuing description of the illustrated embodiment refer to front and rear, and left and right directions as seen in a state of being seated on a seat of the two-wheeled vehicle. Furthermore, a longitudinal axis refers to a front to rear axis relative to
5 the vehicle, while a lateral axis refers to a side to side, or left to right axis relative to the vehicle. Also, it is to be understood that the phraseology and terminology used herein is for the purpose of description and should not be regarded as limiting.

[00032] Fig.1 illustrates a side view of a two-wheeled vehicle (1) in
10 accordance with one embodiment of the present invention. As per one embodiment, in a front portion (F) of the vehicle (1), a steering shaft (not shown) is supported rotatably in a certain range. Further a handlebar (8) is rotatably integrally connected to the steering shaft for steering the vehicle (1), and is connected to a front wheel (6) through the steering shaft. An upper portion of the
15 front wheel (6) is covered by a front fender (11) which prevents mud and water from getting deflected towards the steering shaft. The front wheel (6) is rotatably mounted on the front portion (F) thereof and a rear wheel (4) is rotatably mounted on a rear portion (R) thereof. Further, a front fork assembly (not shown) is mounted over the front fender (11). In a portion lying ahead of the front fork
20 assembly, a lighting device such as a headlamp (5), a pair of signaling devices such as turn signal lamps (not shown), a display device such as a speedometer (not shown) are housed by a holding structure (not shown) mounted thereto. A two-legged stand (7) is used to support and hold the vehicle (1). The stand (7) moves on a pivot (not shown) to take up two positions, one folded up and the
25 other on the ground.

[00033] Furthermore, in the front portion (F) of the motorcycle (1), a fuel tank (2) is arranged immediately behind a head pipe (not shown) and is disposed over an internal combustion engine (100). A seat assembly (3) is disposed immediately behind the fuel tank (2). The seat assembly (3) includes a rider seat and a pillion
30 (10) is disposed rearwardly of the seat assembly (3). Suspension systems are

provided for comfortable steering of the vehicle (1) on the road. The front fork assembly (not shown) forms the front suspension system and serves as a rigidity component. Further, a rear suspension system, which is a hydraulic damped arrangement, is connected to the body frame (not shown) at the rear portion (R) thereof. In the present embodiment, an internal combustion engine (100) is mounted to a front lower portion of the body frame (not shown) by means of an engine mounting bracket. The engine (100) is equipped with an exhaust system that includes an exhaust pipe (not shown) connected to the engine (100) and a muffler (not shown) connected to the exhaust pipe. The muffler (not shown) extends rearwards along the right side of a rear wheel (4).

[00034] Referring to Fig.2, the internal combustion engine (100) includes a cylinder block (102) slanted somewhat forwardly a crank case (200) and integrally formed at a lower end of the cylinder block (102). A cylinder head (101) is superposed on an upper end surface of the cylinder block (102) and which is fixed by bolts and a head cover (105) is superposed on an upper end surface of the cylinder head (101) and is fixed to a cam holder (not shown) by a bolt so as to define a valve motion chamber between the head cover (105) and the cylinder head (101). The cylinder block (102) and the crankcase (200) are integrally formed from a casting. The crankcase (200) is divided into right and left crankcase (200L), (200R) integrally on the housing. A clutch cover (400) is coupled to the right crankcase (200R).

[00035] Fig. 3 shows a perspective view of the internal combustion engine with an oil cooler (106), as per one embodiment. In one embodiment of the present invention, a cooling system for the vehicle (1) includes the oil cooler (106), which provides cool oil to moving parts which undergo the highest wear and generate the most heat. As per one embodiment, the oil cooler (106) is located in front of the engine (100). An inlet (107) of the oil cooler (106) supplies non-cooled oil through the first oil path (302a) to the oil pump (300) and through an outlet (108) of the oil cooler (106), the cooled oil is pumped to the supply chamber (401). As per one embodiment of the present invention, the cylinder

block (102), the cylinder head (101) and the cylinder head cover (105) are mounted on the upper portion of the crankcase (200). A carburetor (not shown) is connected to an intake port of the cylinder head (101), and an air cleaner (not shown) is connected to the rear side of the carburetor. An air passage duct (109) has an inlet port positioned in a space between the fuel tank (3) (shown in Fig.1) and the engine (100) closely to a rear portion of the oil cooler (106). In one embodiment, the air flowing from behind the oil cooler (106) is guided through the air passage duct (108).

[00036] Fig 4 illustrates the rear surface of the right crankcase (200R) of the internal combustion engine (100) said crankcase (200), as per one embodiment. In one embodiment of the present invention, the crankcase (200) includes the right and left crankcase (200L), (200R). The crankcase (200) is divided in the longitudinal direction into the front surface and the rear surface. As per one embodiment, the oil pump (300) housed in the right crankcase (200R) discharges the lubricating oil in response to the rotation of a crankshaft (not shown) of the engine (100). The oil sump (305) located below the oil pump (300) in the crankcase (200R) includes the inlet port (301) and the discharge port (302) for supplying lubricating oil from said oil sump (305) to respective components of the internal combustion engine (100). As per one embodiment of the present invention, the lubricating oil from the oil sump (305) is dispensed in said at least one oil path (302a), (302b) including the first oil path (302a) and the second oil path (302b). The first oil path (302a) is having a diameter greater, equal or smaller than the second oil path (302b).

[00037] Further in Fig.4, as per one embodiment of the present invention, said lubricating oil supplied to each of the respective lubricating parts is returned to the oil sump (305) through oil passages and oil recirculation passages, thereby enabling the oil to be again circulated from the passages to the respective lubricating parts of the engine (100).

[00038] Fig. 5 illustrates an enlarged plan view of the oil pump illustrating said at least one oil path (302a),(302b) and said at least one supply passage (304).

As per one embodiment of the present invention, the lubrication system (100a) for an internal combustion engine (100) comprises the right crankcase (200R), the oil sump (304) formed at a bottom of the right crankcase (200R), the oil pump (300) supplies the lubricating oil from said oil sump (305) to respective lubricating parts of the engine (10). The oil pump (300) includes the inlet port (301) and the discharge port (302). The supply chamber (401) is set between the oil pump (300) and said respective lubricating parts of the engine (100) and includes the first introduction port (401a) and the second introduction port (401b). According to one embodiment of the present invention, said discharge port (302) is being configured to dispense said lubricating oil into at least one oil path (302a), (302b) including the first oil path (302a) and the second oil path (302b). The first oil path (302a) in communication with the oil cooler (106) supplies cooled oil to the supply chamber (401) through said first introduction port (401a) and the second oil path (302b) in communication with said at least one supply passage (303) supplies non-cooled oil to the supply chamber (401) through said second introduction port (401b). The semi-cooled oil formed by the introduction of said cooled and said non-cooled oil into said supply chamber (401) is circulated to the respective lubricating parts of the engine (100) through the oil distribution port (401c).

[00039] Further in Fig.5, said discharge port (302) is having said at least one opening (304) configured to pump and dispense said lubricating oil in said at least one oil path (302a), (302b). As per embodiment of the present invention, the first oil path (302a) is located adjacent to the second oil path (302b) for conducting the lubricating oil from said oil sump (305) to said respective lubricating parts of the engine (100). The oil distribution port (401c) is located between said oil pump (300) and the respective lubricating parts of the engine (100).

[00040] Fig. 6 is a partial sectional view taken in a longitudinal direction of the right crankcase (200R) illustrating said at least one oil path (302a), (302b) including the first oil path (302a) and the second oil path (302b). As per one embodiment of the present invention, the lubricating oil from the oil sump (305)

is pumped into said at least one oil path (302a), (302b) including said first oil path (302a) and said second oil path (302b). At discharge port (302), the oil from the oil pump (300) is pumped in the way that it in communication with said oil cooler (106) leads to said first introduction port (401a) for discharging cooled oil to the supply chamber (401) and the said second oil path directly leading to said supply chamber (401) through at least one supply passage (303) comprises an opening (304) and thus, the oil is received in at least one receiving passage (402) of the clutch cover (400). Thus, said cooled oil and said non-cooled oil, get mixed in said supply chamber (401) to form the semi-cooled oil. The semi-cooled oil is supplied through the oil distribution port (401c) to said lubricating parts of the engine (100).

[00041] Fig. 7 shows a perspective front view of the clutch cover (400) illustrating the supply chamber (401) and the position of the first introduction port (401a) and the second introduction port (401b) thereon. According to the present invention, the supply chamber (401) is attached to the clutch cover (400) being coupled to said crankcase (200). As per one embodiment of the present invention, the supply chamber (401) houses an oil filter. The rear surface of the right crankcase (200R) includes said at least one supply passage (303) formed which communicates to said at least one receiving passage (402) formed in the rear surface of said clutch cover (400) through an oil supply opening (304) leading to said second introduction port (401b). According to one embodiment of the present invention, the diameter of said first oil path (302a) is greater, lesser or equal to the diameter of the second oil path (302b). The oil pump (300) supplies oil directly to a filter chamber for filtration prior to communicating said oil to said to respective lubricating parts of the engine (100). The respective components of the engine (100) to be lubricated includes, crankshaft cylinder head, main bearings, shafts, gears pistons, etc.

[00042] Fig. 7a shows a flow diagram of the lubrication system as per one embodiment of the present invention. In one embodiment, the oil pump (300) is configured for supplying lubricating oil from the oil sump (305) to respective

engine parts to be lubricated. In one embodiment, said oil pump (300) includes the inlet port (301) and the discharge port (302). The discharge port (302) is configured to dispense said lubricating oil into at least one oil path (302a), (302b) including the first oil path (302a) and the second oil path (302b). In one
5 embodiment, said first oil path (302a) in communication with said oil cooler (106) supplies cooled oil to the supply chamber (401) being coupled to the clutch cover (400) through said first introduction port (401a) and wherein said second oil path (302b) in communication with said at least one supply passage (303) supplies non-cooled oil to the supply chamber (401) being coupled to the clutch cover
10 (400) through said second introduction port (401b). Further, as per one embodiment, said semi-cooled oil formed by introduction of said cooled and said non-cooled oil into said supply chamber (401) is circulated to the respective lubricating parts of the engine (100) through an oil distribution port (401c).

[00043] Fig. 8 a perspective view of the rear surface of the clutch cover
15 illustrating said at least one oil receiving passage for receiving said non-cooled oil from the rear surface of the right crankcase (200R) (shown in Fig.4). As per one embodiment of the present invention, the supply chamber (401) that houses said oil filter is attached to the clutch cover (400) of the internal combustion engine (10). In one embodiment of the present invention, the supply chamber (401) is
20 designed to remove contaminants from engine oil.

[00044] Further in Fig.8, the first oil introduction port (401a) and the second oil introduction port (401b) is provided on the supply chamber (401) of the clutch cover (400), and is branched into plurality of oil passages, thus distributing said lubricating oil to the respective lubricating parts of the engine. (100). The plurality
25 of oil passages is provided with an orifice for supplying oil to all the moving and lubricating parts of the engine. According to one embodiment of the present invention, said supply chamber (401a) in communication with the discharge port (302) of the oil pump (300) is fitted to the clutch cover (400). The semi-cooled oil from the supply chamber (401) with the oil distribution port (401c) located in the
30 supply chamber (401c) is distributed through plurality of oil passages provided

with the orifice for supplying the oil at controlled pressure and temperature to the respective lubricating parts engine (100).

[00045] It is advantageous to have the discharge port of the oil pump being configured to pump said lubricating oil into at least one path including the first oil path and the second oil path. The semi-cooled oil formed by the introduction of the non-cooled oil and cooled oil into the supply chamber is distributed to the respective lubricating parts of the engine. Thus, the time taken by the lubricating oil to reach crankshaft, cylinder head, gears shafts and other lubricating parts of the engine is minimized hence avoiding any reduction in the durability of parts.

10 With separate forming of said at least one paths, that is the first oil path and the second oil path for supplying cooled and non-cooled oil respectively to the supply chamber, the use of higher flow rate pump required for faster reach of oil to crankshaft, cylinder head and gears/shafts is eliminated. The other benefits attained by one embodiment of the present invention results in the reduction in

15 number of parts, thereby resulting in overall reduction of the maintenance cost. Furthermore, the semi-cooled oil flowing to the respective lubricating parts of the engine, can extract more heat of the combustion chamber of the engine as compared to non-cooled oil, thus making the engine to run more efficiently.

[00046] Improvements and modifications may be incorporated herein without

20 deviating from the scope of the invention.

We Claim:

1. A lubrication system (100a) for an internal combustion engine (100) comprising:
a crankcase (200);
an oil sump (305) formed at a bottom of the crankcase (200);
an oil pump (300) configured for supplying lubricating oil from said oil sump (305) to respective lubricating parts of the engine (100), said oil pump (300) includes an inlet port (301) and a discharge port (302); and
a supply chamber (401) set between the oil pump (300) and said respective lubricating parts of the engine (100), said supply chamber (401) includes a first introduction port (401a) and a second introduction port (401b);
said discharge port (302) is configured to dispense said lubricating oil into at least one oil path (302a), (302b) including a first oil path (302a) and a second oil path (302b); said first oil path (302a) in communication with an oil cooler (106) supplies cooled oil to the supply chamber (401) through said first introduction port (401a); and said second oil path (302b) in communication with at least one supply passage (303) supplies non-cooled oil to the supply chamber (401) through said second introduction port (401b); and further a semi-cooled oil formed by introduction of said cooled and said non-cooled oil into said supply chamber (401) is circulated to the respective lubricating parts of the engine (100) through an oil distribution port (401c).
2. The lubrication system (100a) as claimed in claim 1, wherein said discharge port (302) is having at least one opening configured to pump and dispense said lubricating oil in said at least one oil path (302a), (302b).
3. The lubrication system (100a) as claimed in claim 2, wherein said first oil path (302a) of said at least one oil path (302a), (302b) is configured adjacent to the second oil path (302b) for conducting oil from said oil sump to said respective lubricating parts of the engine (100).
4. The lubrication system (100a), as claimed in claim 1, wherein said oil distribution port (401c) is located between said oil pump (300) and the respective lubricating parts of the engine (100).
5. The lubrication system (100a), as claimed in claim 1, wherein said supply chamber (401c) is attached to a clutch cover (400) being coupled to said crankcase (200).

6. The lubrication system (100a) as claimed in claim 1, wherein said supply chamber (401) houses an oil filter therein.
7. The lubrication system (100a), as claimed in claim 1, wherein said at least one supply passage (303) formed in an inner surface of said crankcase (200) communicates to at least one receiving passage (402) formed in a inner surface of said clutch cover (400) through an oil supply opening leading to said second introduction port (401b).
8. The lubrication system (100a) as claimed in claim 1, wherein diameter of said first oil path (302a) is greater, lesser or equal to the diameter of the second oil path (302b).
9. The lubrication system (100a) as claimed in claim 1, wherein said oil pump (300) supplies oil directly to a filter chamber for filtration prior to communicating said oil to said respective lubricating parts of the engine (100).
10. The lubrication system (100a) as claimed in claim 1, wherein said respective lubricating parts of the engine (100) includes transmission, crankshaft, cylinder head, main bearings and accessory drive gears.

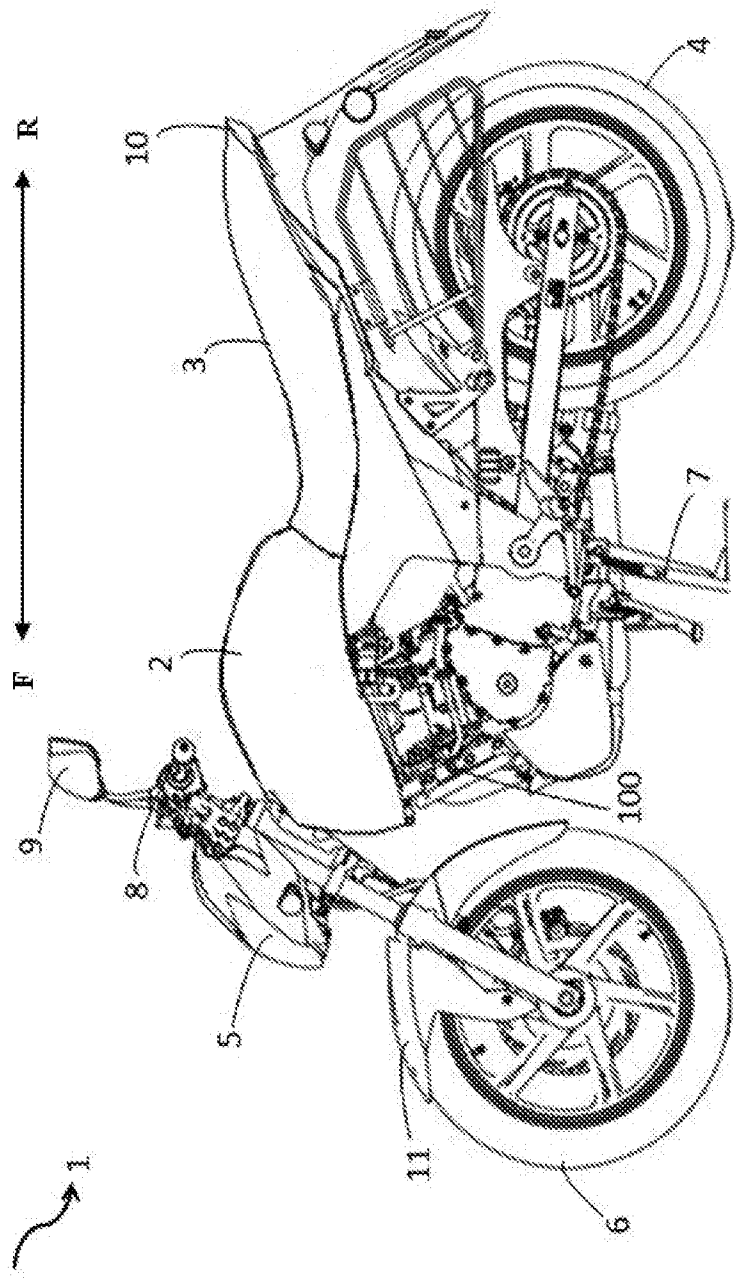


Fig. 1

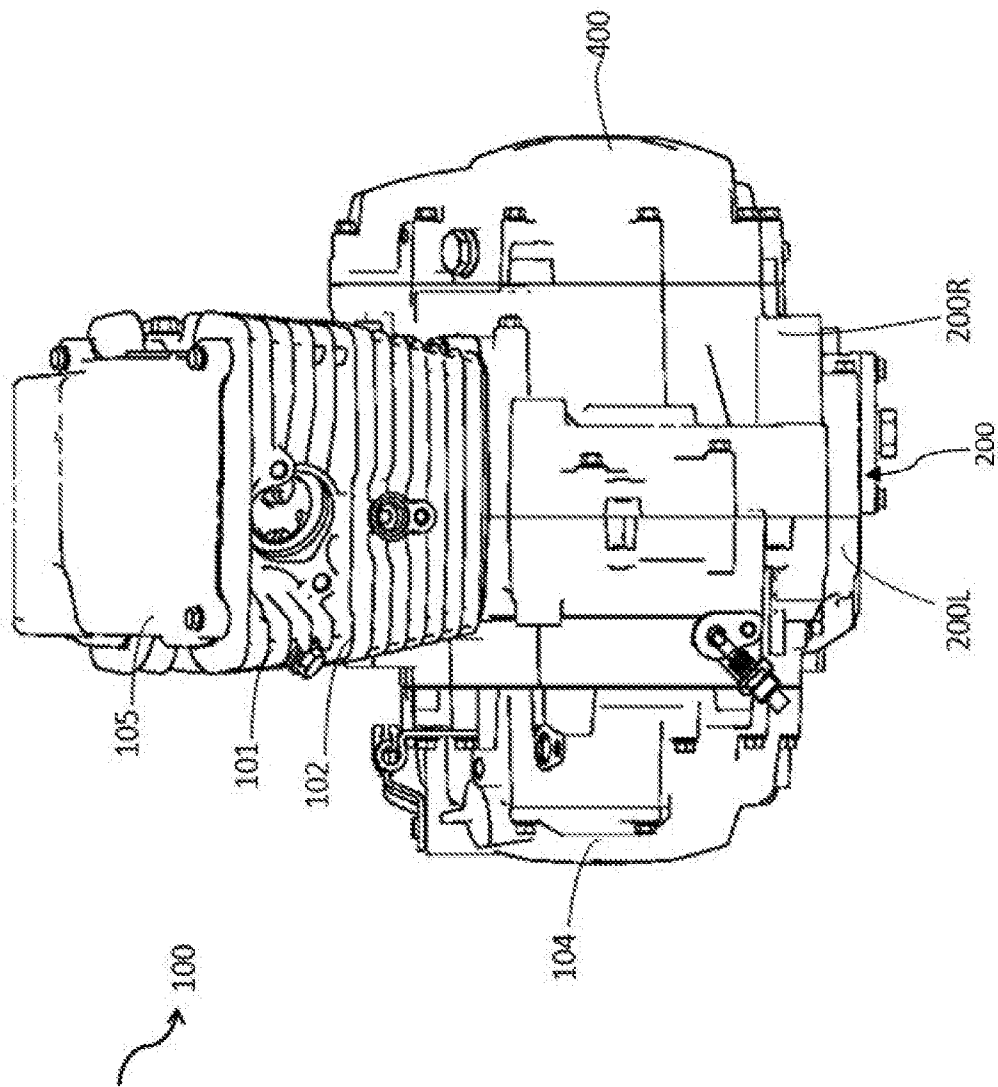


Fig. 2

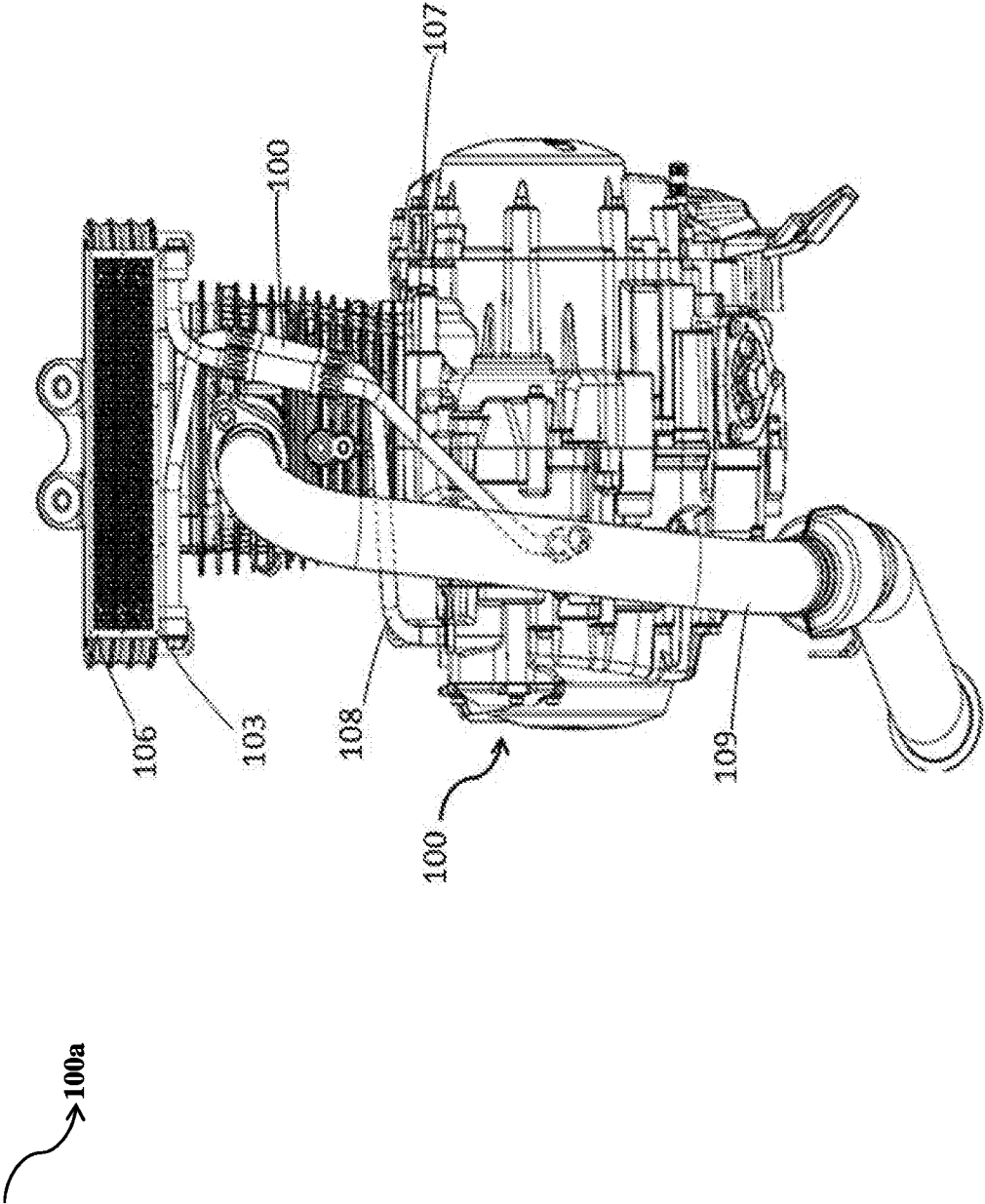


Fig. 3

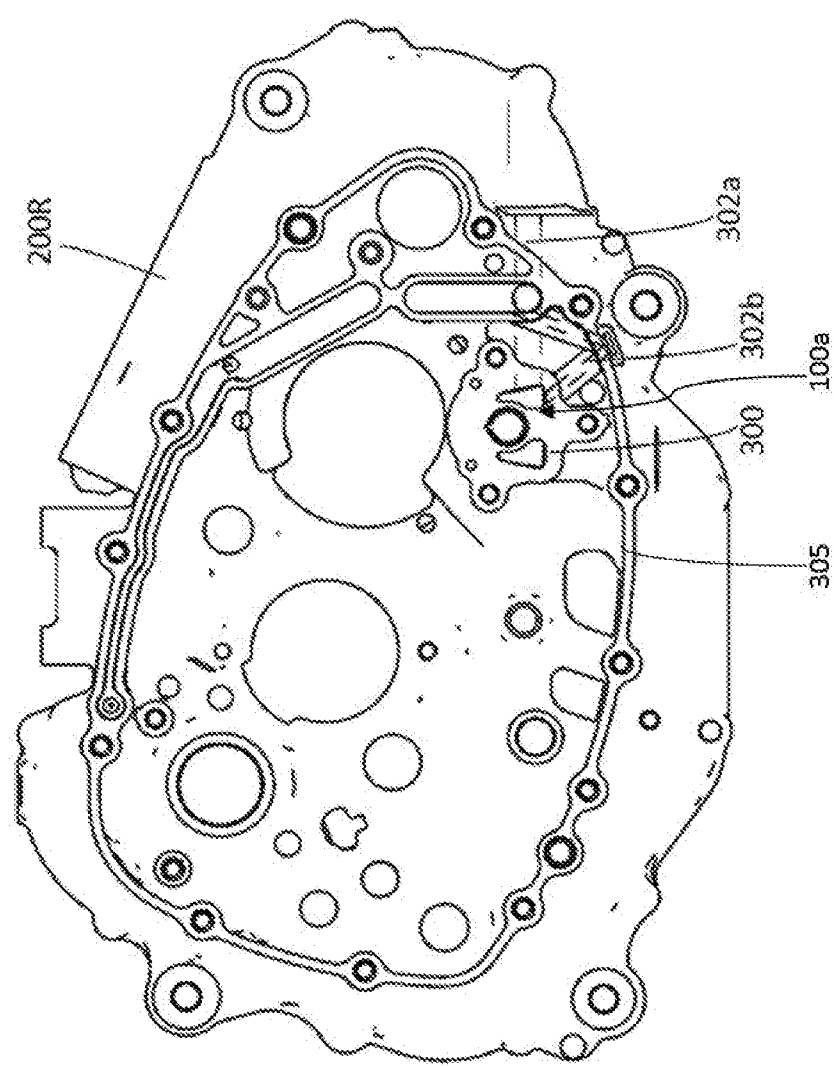


Fig. 4

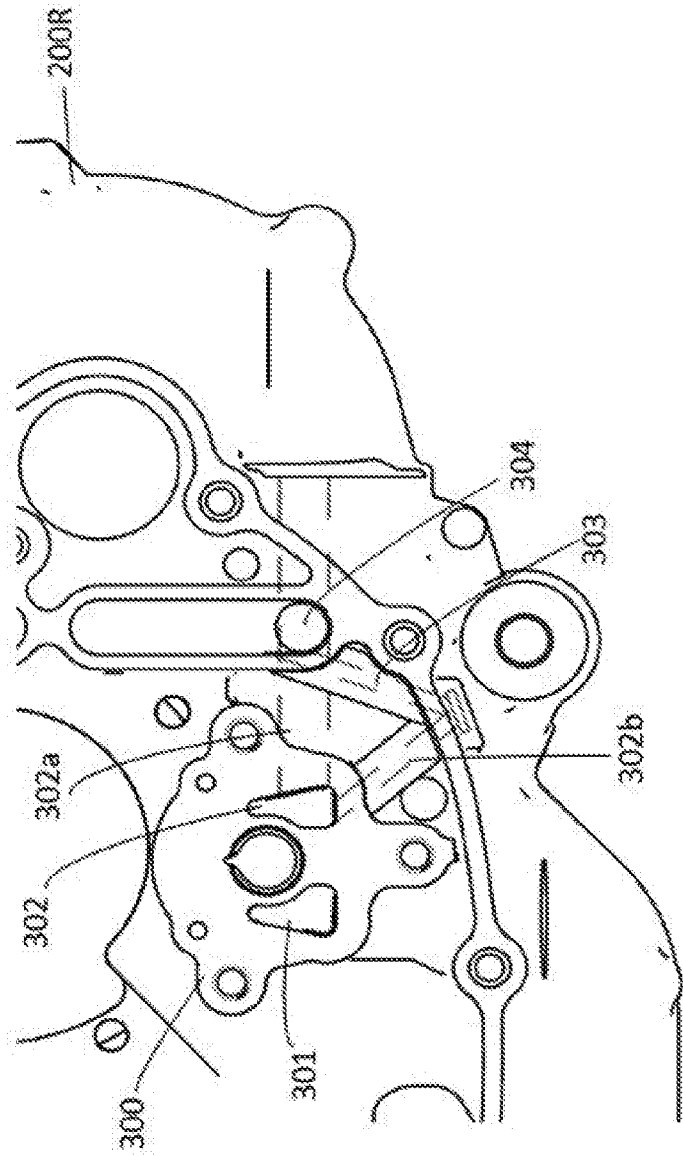


Fig. 5

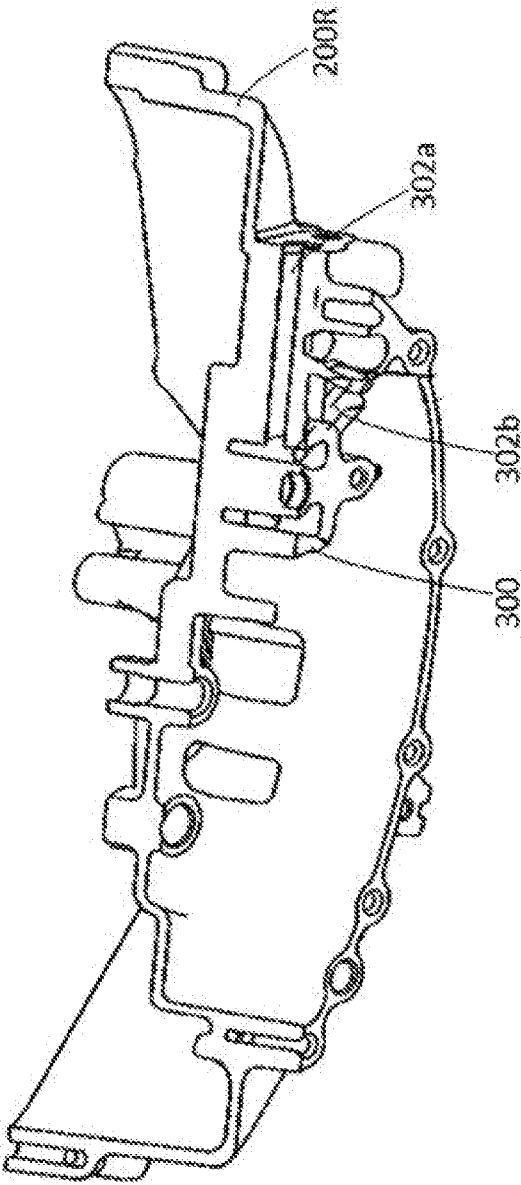


Fig. 6

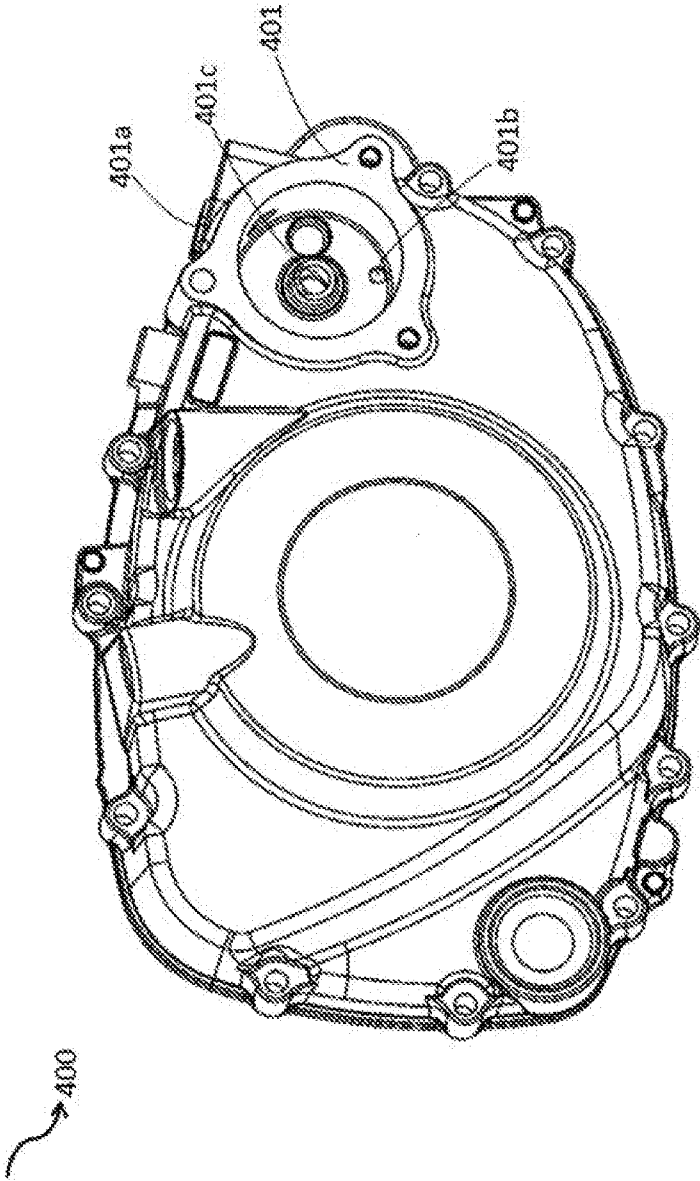


Fig. 7

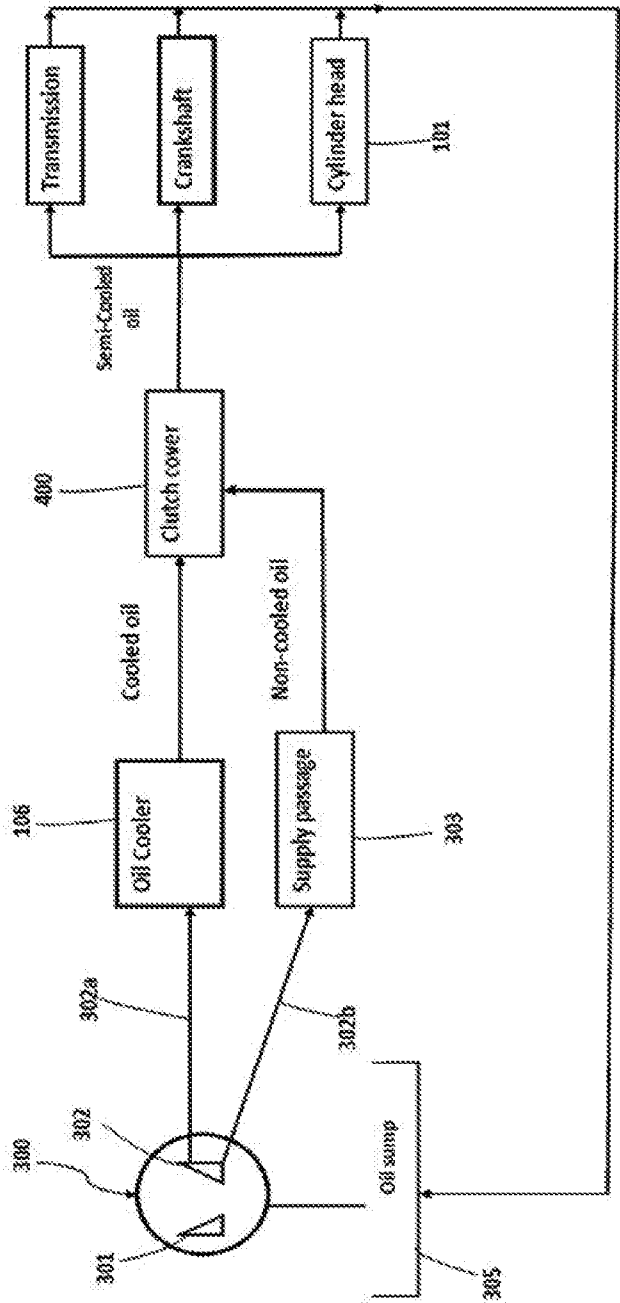


Fig.7a

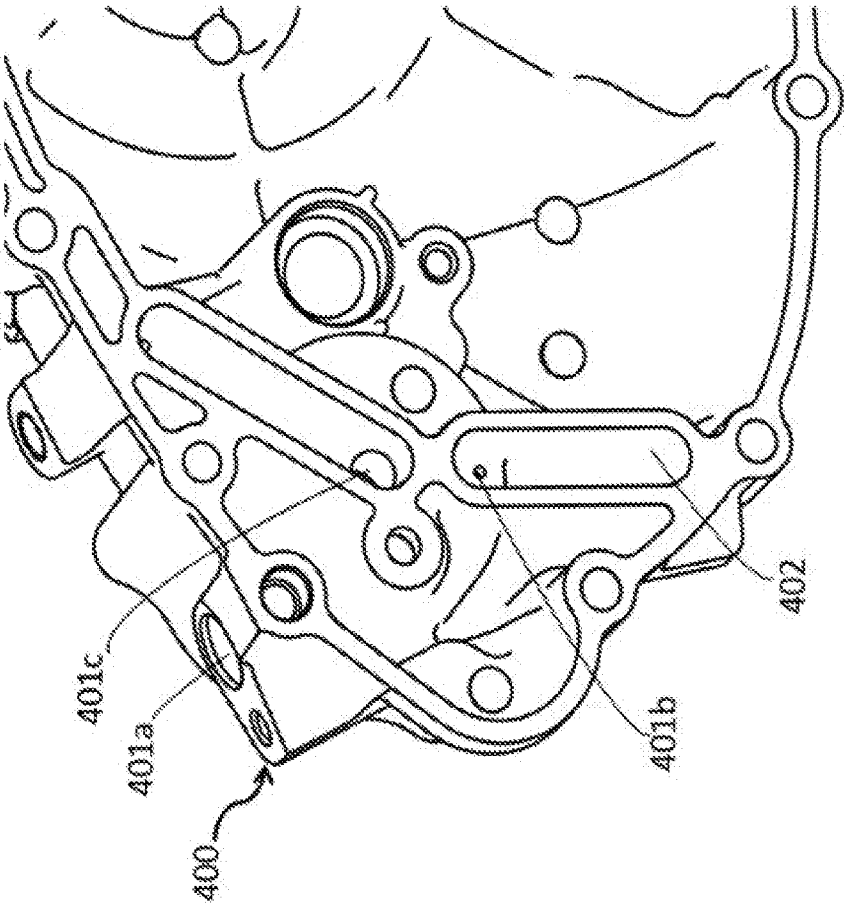


Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IB2017/055555

A. CLASSIFICATION OF SUBJECT MATTER
F16N7/00, F01M1/00 Version=2018.01

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: F16N, F01M, F01P, F16H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Patseer, IPO Internal Database

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 20080314572 A1 (GM GLOBAL TECHNOLOGY OPERATIONS INC.) 25 DEC 2008 (25-12-2008); Description para [0017], [0013]; Fig. 1,3-6; claim 1; -----	1-10
Y	US 20150260273 A1 (HONDA MOTOR CO.LTD.) 17 SEP 2015 (17-09-2015); Description para [0005],[0019]; Fig. 1;	1-10

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	"&" document member of the same patent family

Date of the actual completion of the international search

10-01-2018

Date of mailing of the international search report

10-01-2018

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/IB2017/055555

Citation	Pub.Date	Family	Pub.Date
US 20080314572 A1	25-12-2008	CN 101332794 A	31-12-2008
		DE 102008029322 A1	22-01-2009
US 20150260273 A1	17-09-2015	CN 104913035 A	16-09-2015
		DE 102015203462 A1	17-09-2015
		US 9695928 B2	04-07-2017