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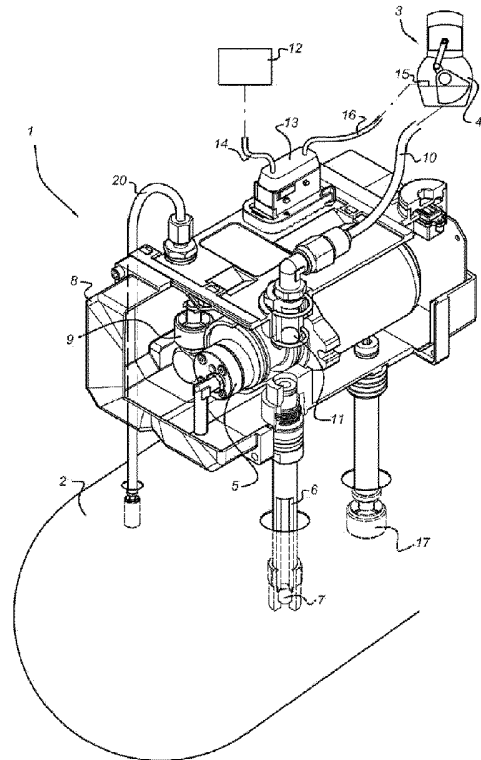
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54 **Oil management system for an internal combustion engine, and a method for oil management of such an engine.**

57 The present invention relates to an oil management system for an internal combustion engine that comprises a crankcase. The oil management system comprises a first container for storage of a first quantity of oil and a second container for temporary storage of a predetermined second quantity of oil. The oil management system further comprises a pump arranged for operating in a first and a second mode, in which modes oil is transferrable respectively to and from the second container, and a flow measuring unit arranged for measuring an oil flow to or from the second container when the pump is operating. The oil management system is arranged for delivery of the predetermined second quantity of oil to the crankcase in dependence of the measured oil flow. The invention also relates to a method for oil management of an internal combustion engine that comprises a crankcase.



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Dit octrooi is verleend ongeacht het bijgevoegde resultaat van het onderzoek naar de stand van de techniek en schriftelijke opinie. Het octrooischrift komt overeen met de oorspronkelijk ingediende stukken.

Oil management system for an internal combustion engine, and a method for oil management of such an engine

The present invention relates to an oil management system for an internal combustion engine that comprises a crankcase. The present invention also relates to a method for oil management of such an engine.

A large fleet of for example trucks, busses or generator sets generally comprises many different types of internal combustion engines that comprise a crankcase. This large variety of types of engines is not in the least owing to ongoing developments with respect to achieving cleaner internal combustion engines. As each type of such engines requires a specific type of oil, based on their technical standard and temperature circumstances, it has become increasingly difficult to manage oil levels of a large fleet of engines.

Furthermore, checking of an oil level in the crankcase of an engine can be quite difficult because engines for example are being operated continuously or are located at remote places or are being rented and are therefore not easily accessible for maintenance by the owner and/or maintenance personnel. In addition, as it is very difficult to predict the right moment for checking the oil level in the crankcase, typically many unnecessary checks are being carried out. Especially in the case of big fleets this gives rise to significant and in fact unnecessary costs.

A main problem with respect to oil management of an internal combustion engine comprising a crankcase is how to replenish the oil in the crankcase such that the oil level in the crankcase does not drop below a predetermined minimum level and does not exceed a predetermined maximum level. A related problem is how to reliably determine the actual oil level in the crankcase. A first source of inaccuracy with respect to determining the actual oil level in the crankcase might be waiting not long enough after the engine has been shut down before checking the oil level. In this case, not all of the oil has had a chance to flow back into the crankcase yet. Important aspects for determining a sufficiently long waiting time are type of oil used, in particular its viscosity, and temperature conditions under which the engine is operated as this has an impact on the viscosity of the oil. A second source of inaccuracy with respect to determining the actual oil level in the crankcase might be the engine not being in a level position at the time the oil level is being checked.

It is well known that an engine will get damaged if the oil level in the crankcase drops below a predetermined minimum level and a sufficient amount of oil is not replenished in due time. However, if the actual oil level in the crankcase cannot be determined reliably, it practically is a mere guess how much oil has to be replenished.

5 In the case that an amount of oil is replenished such that a predetermined maximum oil level is exceeded the engine can also get damaged eventually as for example oil seals can start leaking due to too high pressure. In addition, excess oil in the crankcase will be burned and possibly contaminates a catalytic convertor of an exhaust system. It will be clear that such a waste of expensive oil and damage to the engine and/or to the  
10 exhaust system at least needs to be reduced.

Hence, it is important to be able to replenish the right amount of oil, i.e. an amount of oil such that the oil level in the crankcase will be between predetermined minimum and maximum levels. In addition, it is important to be able to replenish the right type of oil for each specific type of engine.

15 It is a first object of the present invention to provide an oil management system that enables replenishment of the right amount and type of oil in the crankcase of an internal combustion engine in such a way that the oil level in the crankcase is between predetermined minimum and maximum levels. It is a second object of the present invention to provide a method for oil management of an internal combustion engine  
20 that comprises a crankcase.

At least one of these objects is achieved by an oil management system that comprises a first container for storage of a first quantity of oil and a second container for temporary storage of a predetermined second quantity of oil, the oil management system further comprises a pump arranged for operating in a first and a second mode,  
25 in which modes oil is transferrable respectively to and from the second container, and a flow measuring unit arranged for measuring an oil flow to or from the second container when the pump is operating, wherein the oil management system is arranged for delivery of the predetermined second quantity of oil to the crankcase of the internal combustion engine in dependence of the measured oil flow.

30 The crankcase of for example a big truck can comprise 15 to 20 liters of oil. The first container of the oil management system stores a first quantity of oil, for example 6 to 20 liters, which should enable the truck to span a distance of for example 100,000 kilometers before the oil needs to be changed. An advantage of such a large storage

container is that during a period in which the abovementioned distance is covered a right type of oil is available for a specific type of engine and the temperature conditions under which that engine has to operate. The second container is used for temporary storage of the predetermined second quantity of oil that lies in a range of for example 5 0.2 to 0.8 liter, preferably is 0.5 liter. The second container is filled with oil from the first container when the pump operates in a first mode. In the first mode, which is referred to as sucking phase, the pump sucks oil from the first into the second container. The pump is for example an electrically driven gear pump, which can easily change turning direction.

10       When the second container is full, the pump is switched to a second mode of operation. In the second mode, which is referred to as pressing phase, the pump transfers the predetermined second quantity of oil, preferably 0.5 liter, to the crankcase of the internal combustion engine. As a result, it is possible to maintain the oil level in the crankcase in a controlled way at an optimal level between predetermined minimum and maximum levels by replenishing the oil in the crankcase as described above in one 15 or more cycles.

Another advantage of replenishing the oil in the crankcase with small amounts, i.e. amounts that lie in a range of for example 0.2 to 0.8 liter, preferably are 0.5 liter, is that pollution of the oil can be reduced better than in the case that large amounts of oil, 20 i.e. amounts that lie in a range of for example 2 to 4 liters, are replenished at once.

The flow measuring unit enables determining the time required to fill or empty the second container independently of temperature and type of oil, in particular viscosity, used. In this way a disadvantageous predetermined pumping time can be avoided.

25       When using a predetermined pumping time, a first possible situation could occur in which for example due to a lower viscosity of the oil than expected, the second container would not be filled to a predetermined level, for example a maximum level, at the end of the predetermined pumping time. In this situation, the actual amount of oil in the second container could be unknown. Consequently, an insufficient amount of oil 30 would be transferred from the second container to the crankcase. Eventually, this could lead to problems if the oil level drops below a predetermined minimum oil level in the crankcase.

In a second possible situation, the actual amount of oil in the second container could be known if sensors at predetermined levels would be provided. Such sensors could at least give an estimate of the amount of oil present in the second container. Based on this information additional pump time could be calculated in order to fill the second container to a predetermined level, for example to a maximum level. After switching the pump from the first mode of operation to the second mode of operation the content of the second container could be transferred to the crankcase. However, complexity, cost and chance of failure of the oil management system would increase because of the need for additional and/or more complex sensors and/or increased capability of software and control electronics.

In a case that the viscosity of the oil is higher than expected, the second container would be filled until the predetermined level, for example the maximum level, before the end of the predetermined pumping time. Reaching of the latter level should be detected and a control signal should be sent to the gear pump either to turn it off in order to prevent damage in particular to the pump and/or to the second container because of too high a pressure exerted by the compressed oil, or to switch the pump into the second mode of operation in which it transfers oil from the second container to the crankcase. In order to prevent damage due to possible overfilling of the second container and to enable venting, a third tube can be provided between the first and the second container. Excess oil can flow from the second container into the first container via the third tube. When the pump is in the pressing phase, the third tube enables venting of the second container.

Reaching of a predetermined minimum level should also be detected and a control signal should be sent to the pump either to turn it off in order to prevent damage in particular to the gear pump because of oil shortage as the gear pump should continuously be submerged in oil, or to switch the pump into the first mode of operation in which it transfers oil from the first container to the second container.

In a case that the viscosity of the oil is much lower than expected or that no oil is available, the pump is switched off if no control signal is received a predetermined time interval after switching on the pump.

In an embodiment of the oil management system according to the present invention, the flow measuring unit comprises a first sensor for detecting a predetermined first oil level between a minimum and a maximum oil level in the

second container. Upon detection of the predetermined first oil level in the second container a first time interval, which was required for transferring the oil from the first to the second container and for reaching the predetermined first level in the second container, is known. The oil flow can easily be calculated. Consecutively, a second  
5 time interval, which is required for filling the second container until the predetermined maximum level, can be calculated. After the second time interval the predetermined maximum oil level in the second container is reached and the pump is switched off and/or switched into its second mode of operation in which it pumps oil from the second container towards the crankcase of the internal combustion engine.

10 The first sensor could also be constructed and arranged such that it starts measuring the oil level in the second container after switching on the pump in the first mode of operation. Upon reaching of the predetermined first oil level in the second container the first time interval is known and the oil flow can be calculated. At the end of the second time interval the pump can be switched off and/or switched to its second  
15 mode of operation.

An advantage of measuring the oil flow when the pump is operating, is that it suffices to provide a single sensor. This reduces the complexity and thereby the costs of the oil management system. The single sensor can practically be arranged at any position between the predetermined minimum and maximum oil levels. As the actual  
20 position of the single sensor with respect to the predetermined minimum and maximum oil levels is known, the second time interval can be calculated. Preferably, the single sensor is arranged in the second container halfway between the predetermined minimum and maximum oil levels. In this case, the second time interval is equal to the first time interval.

25 In the case that a disadvantageous predetermined pumping time is used at least two sensors would be required, i.e. a sensor for determining a predetermined minimum oil level in the second container and another sensor for determining a predetermined maximum oil level in the second container. Upon detection of the predetermined minimum oil level in the second container, the gear pump should be turned off in order  
30 to prevent it from being damaged because of oil shortage as the gear pump should continuously be submerged in oil. Alternatively, the gear pump could be switched into the first mode of operation in which oil from the first container is transferred to the second container. Upon detection of the predetermined maximum oil level in the

second container, the gear pump should be turned off in order to prevent it from being damaged because of too high a pressure exerted by the compressed oil. Alternatively, the gear pump could be switched into the second mode of operation in which oil from the second container is transferred to the crankcase.

5           Another advantage of placing the first sensor at a position not higher than halfway the predetermined minimum and maximum oil levels is that feedback about filling of the second container is available earlier than in a case when the sensor would be placed higher. In particular, in this case it is possible to limit suction time of the pump in the case that the first container is empty in order to avoid damage to the pump  
10 as a result of running without oil.

          In an embodiment of the oil management system according to the present invention, the oil management system is connectable to an engine management system for providing a first trigger to the oil management system. The oil management system needs to receive a trigger in order to start replenishment of the oil in the crankcase. A  
15 first trigger can be provided by data from the engine management system. Such data can comprise mileage over a predetermined period of time, running hours and signals from an oil level sensor in the crankcase, a heat sensor and/or a pressure indicator. By connecting the engine management system with the oil management system this data is exchangeable. A Can-Bus communication system can be used for this.

20           In an embodiment of the oil management system according to the present invention, the oil management system is connectable to a second sensor that is arranged for measuring a second oil level in the crankcase of the internal combustion engine and providing a second trigger to the oil management system. The second sensor can be an external sensor based on the principle of communicating vessels. For optimum  
25 operation of the engine the second oil level in the crankcase should be maintained between predetermined minimum and maximum levels. Depending on the preferred oil replenishment strategy, the second sensor provides a second trigger to the oil management system to start the replenishment of oil in the crankcase. The second trigger can be used alone when there is no first trigger provided by the engine  
30 management system. Replenishment of the oil in the crankcase can be done in one or more of the above described cycles.

          In an embodiment of the oil management system according to the present invention, when the pump is operating in the first mode, oil is transferrable from the

first container to the second container via a first tube that is constructed and arranged for preventing oil from flowing back into the first container. The first tube is provided with a first non-return mechanism, e.g. a non-return valve, that prevents oil after passing this valve from flowing back into the first container when the pump is switched from the first mode of operation into the second mode of operation, i.e. from the sucking phase into the pressing phase. It will be clear to a person skilled in the art that many configurations of the first tube for preventing oil from flowing back into the first container can be envisaged without departing from the scope of the present invention.

In an embodiment of the oil management system according to the present invention, when the pump is operating in the second mode, oil is transferrable from the second container towards the crankcase of the internal combustion engine via a second tube that is constructed and arranged for preventing oil from flowing back into the second container. The second tube is provided with a second non-return mechanism, e.g. a non-return valve, that prevents oil after passing this valve from flowing back into the second container when the pump is switched from the second mode of operation into the first mode of operation, i.e. from the pressing phase into the sucking phase. The second non-return mechanism needs to be closed when the pump is in the sucking phase in order to avoid oil from the crankcase from being pumped back into the second container. It will be clear to a person skilled in the art that many configurations of the second tube for preventing oil from flowing back into the second container can be envisaged without departing from the scope of the present invention.

In an embodiment of the oil management system according to the present invention, the oil management system comprises a third sensor arranged for measuring a third oil level in the first container. In this way the amount of oil left in the first container can be monitored. The oil management system could first check if a sufficient amount of oil is present in the first container before it starts an oil replenishment cycle. If the amount of oil left in the first container is insufficient, a signal can be provided that the first container needs to be replenished with the right type of oil.

In an embodiment of the oil management system according to the present invention, the oil management system comprises an electrical connector arranged for supplying power to the oil management system.

In an embodiment of the oil management system according to the present invention, the electrical connector is arranged for interfacing with the engine

management system, the first, second and/or third sensors. In this way the electrical connector can also be used for exchanging data and/or control signals, which can be analog and/or digital, between the oil management system and the engine management system, the first, second and/or third sensors. The Can-Bus communication system can  
5 be used for this data exchange.

In an embodiment of the oil management system according to the present invention, the pump is a gear pump. Such a pump is very convenient for transferring fluids with a certain viscosity, for example oil, as it can generate sufficient pressure which is needed in the case that long supply lines have to be applied for interconnecting  
10 the second container and the crankcase of the engine. It will be clear to a person skilled in the art that many configurations of the gear pump can be envisaged without departing from the scope of the present invention.

According to another aspect of the present invention, a method is provided for oil management of an internal combustion engine that comprises a crankcase. The method  
15 comprises:

- determination of a predetermined oil level in the crankcase of the internal combustion engine,
- pumping of oil from a first container comprising a first quantity of oil to a second container for temporarily storing a predetermined second quantity of oil,  
20 - measurement of an oil flow to or from the second container when the pump is operating,
- delivery of the predetermined second quantity of oil from the second container to the crankcase of the internal combustion engine in dependence of the measured oil flow.

25 By applying this method, the crankcase of an engine can be replenished with a predetermined amount of oil that for example corresponds with the content of the second container. Depending on the oil replenishment strategy, the method described above can be repeated several times. This is particularly advantageous for replenishing small amounts, i.e. amounts that lie in a range of for example 0.2 to 0.8 liter. Hence, it  
30 is possible to replenish the oil in the crankcase in a cyclic way.

The invention will be explained in more detail below with reference to drawings in which an illustrative embodiment of the invention is shown. The person skilled in the art will realize that other alternatives and equivalent embodiments of the invention can

be conceived and reduced to practice without departing from the scope of the present invention.

Figure 1 shows a schematic perspective view of an embodiment of an oil management system according to the present invention, wherein of some components of the system at least a part partially has been cut away in order to show how several components are internally arranged.

Figure 2 shows the oil management system according to figure 1 from a different view point.

The figures are not necessarily drawn to scale. In the figures identical components are denoted by the same reference numerals.

Figure 1 shows that the embodiment of the oil management system 1 according to the present invention comprises a first container 2 in which a first quantity of oil can be stored. In an oil management system 1 of an engine 3 comprising a crankcase 4 of for example a truck, the first container 2 can have a volume in a range of 6 to 20 liters. Having such a volume in storage, the truck should be able to span a distance of for example 100,000 kilometers before the oil needs to be changed. An advantage of such a large storage container 2 is that during a trip a right type of oil is available for a specific type of engine and the temperature conditions under which that engine 3 has to operate.

The first container 2 is connected to a pump 5, for example an electrically driven gear pump, via a first tube 6 that comprises a first non-return valve 7 that is arranged for preventing oil that has passed it from flowing back into the first container 2 when the pump 5 is switched from a first mode of operation into a second mode of operation, i.e. from the sucking phase into the pressing phase. In the first mode of operation, i.e. in the sucking phase, the gear pump 5 is arranged for transferring oil from the first container 2 into a second container 8. The second container 8 is used for temporary storage of a predetermined second quantity of oil that lies in a range of for example 0.2 to 0.8 liter, preferably is 0.5 liter. In order to prevent damage due to possible overfilling of the second container 8 and to enable venting, a third tube 20 is provided between the first 2 and the second 8 container. Excess oil can flow from the second container 8 into the first container 2 via the third tube 20. When the pump 5 is in the pressing phase third tube 20 enables venting of the second container 8.

The oil management system 1 further comprises a flow measuring unit that comprises a first sensor 9 for detecting a predetermined first oil level between a

minimum and a maximum oil level in the second container 8. The minimum level can be equal to any suitable predetermined level, for example when the second container 8 is empty. The same holds for the maximum level, for example when the second container 8 is completely full. In the illustrative embodiment of the present invention shown in figure 1, the first sensor 9 is a single level switch that is arranged halfway between the predetermined minimum and maximum oil levels in the second container 8. When the oil transferred into the second container 8 reaches the level switch 9, the flow measuring unit determines a first time interval, which was required for filling the second container 8 until the level switch 9 is reached, and the oil flow is calculated. Consecutively, a second time interval, which is required for filling the second container 8 until the predetermined maximum level, can be calculated. After the second time interval, the predetermined maximum oil level in the second container 8 is reached and the pump 5 is switched off and/or switched into its second mode of operation in which it pumps oil from the second container 8 towards the crankcase 4 of the internal combustion engine 3. In this way it is possible to fill the second container 8 independently of temperature and type of oil, in particular viscosity, used.

It will be clear to the person skilled in the art that the first sensor 9 can practically be arranged at any position between the predetermined minimum and maximum oil levels in the second container 8. As the actual position of the single sensor 9 with respect to the predetermined minimum and maximum oil levels is known, the second time interval can be calculated.

The gear pump 5 is connected to the crankcase 4 of the engine 3 via a second tube 10. In the second mode of operation, i.e. the pressing mode, the gear pump 5 is arranged for transferring oil from the second container 8 into the crankcase 4 of the engine 3. The second tube 10 comprises a second non-return valve 11 that is arranged for preventing oil that has passed it from flowing back into the second container 8 when the pump 5 is switched from the second mode of operation, i.e. the pressing phase, into the first mode of operation, i.e. the sucking phase. The second non-return valve 11 needs to be closed when the pump is in the sucking phase in order to avoid oil from the crankcase 4 from being pumped back into the second container 8.

The second container 8 can be emptied by switching on the gear pump 5 in the second mode of operation, i.e. in the pressing phase, until the level switch 9 is reached. When this happens, the flow measuring unit calculates the oil flow and a fourth time

interval that will be required for emptying the second container 8 until the predetermined minimum level. By switching on the pump 5 in the second mode of operation during the fourth time interval the second container 8 can be emptied until reaching the predetermined minimum level. In this way it is possible to determine the time required to empty the second container 8 independently of temperature and type of oil used or resistance in the second tube 10, due to its length and/or due to crankcase contra pressure. In addition, it will be clear to the person skilled in the art that the predetermined minimum level of oil in the second container 8 should be such that the gear pump 5 remains continuously submerged in oil in order to prevent damage to the pump 5.

For replenishing the oil in the crankcase 4 of the engine 3, the oil management system 1 needs to receive a trigger. A first trigger can be provided by an engine management system 12 that is connected an electrical connector 13 via a first communication link 14. The first communication link 14 can be part of a communication system, for example a Can-Bus communication system that establishes data exchange between the engine management system 12 and the oil management system 1 according to the present invention.

A second trigger to the oil management system 1 can be provided by a second sensor 15 that is arranged for measuring a second oil level in the crankcase 4 of the internal combustion engine 3 via a second communication link 16. For optimum operation of the engine 3 the second oil level in the crankcase 4 should be maintained at an optimal level between predetermined minimum and maximum levels. Depending on the preferred oil replenishment strategy, the second sensor 15 provides a second trigger to the oil management system 1 to start the replenishment of oil in the crankcase 4. The second trigger can be used alone when there is no first trigger provided by the engine management system 12.

Before actually starting an oil replenishment cycle, the oil management system 1 could first check whether a sufficient amount of oil is present in the first container 2. This can be determined by a third sensor 17 that is arranged for measuring a third oil level in the first container 2. If the amount of oil left in the first container 2 is insufficient, a signal can be provided that the first container 2 needs to be replenished with the right type of oil for the engine 3.

In the embodiment of the present invention shown in figure 1, the electrical connector 13 is arranged both for supplying power to the oil management system 1 and for interfacing with the engine management system 12, the first 9, second 15 and third 17 sensors. Data exchange between these components of the oil management system 1 can be established by for example a Can-Bus communication system.

Figure 2 shows the oil management system 1 according to figure 1 from a different view point. In this way it can better be seen that the first sensor 9 is arranged halfway between the predetermined minimum and maximum levels of the second container 8.

Software controlling the oil management system 1 is implemented such that protocols are in place for determining what action should be taken as a result of receipt of a very early or a very late signal from either the engine management system 12 and/or the first 9, second 15 and/or third 17 sensors or in the case that no signal is received at all.

Variations on the embodiment of the oil management system 1 as shown in figures 1 and 2 are imaginable without diverting from the main notion of the invention. It will be clear that the invention is described by using a preferred embodiment. The invention is not intended to be limited to this embodiment. The scope of protection sought is determined by the following claims within the scope of which many modifications can be envisaged.

Conclusies

1. Oliemanagementsysteem voor een interne verbrandingsmotor dat een carter  
omvat, welk oliemanagementsysteem een eerste vat omvat voor opslag van een eerste  
5 hoeveelheid olie en een tweede vat voor tijdelijke opslag van een vooraf bepaalde  
tweede hoeveelheid olie, het oliemanagementsysteem omvat verder een pomp die is  
ingericht om in een eerste en een tweede toestand te werken, in welke toestanden olie  
overbrengbaar is respectievelijk naar en van het tweede vat, en een  
vloeistofstroommeeteenheid die is ingericht om een oliestroom te meten naar of van het  
10 tweede vat wanneer de pomp in bedrijf is, waarbij het oliemanagementsysteem is  
ingericht om de vooraf bepaalde tweede hoeveelheid olie te leveren aan het carter van  
de interne verbrandingsmotor in afhankelijkheid van de gemeten oliestroom.

2. Oliemanagementsysteem volgens conclusie 1, waarbij de  
15 vloeistofstroommeeteenheid een eerste sensor omvat om een vooraf bepaald eerste  
olieniveau tussen een minimum en een maximum olieniveau in het tweede vat te  
detecteren.

3. Oliemanagementsysteem volgens conclusie 1 of 2, waarbij het  
20 oliemanagementsysteem aansluitbaar is op een motormanagementsysteem om een  
eerste trigger te verschaffen aan het oliemanagementsysteem.

4. Oliemanagementsysteem volgens een van de voorgaande conclusies, waarbij  
het oliemanagementsysteem aansluitbaar is op een tweede sensor die is ingericht om  
25 een tweede olieniveau te meten in het carter van de interne verbrandingsmotor en om  
een tweede trigger te verschaffen aan het oliemanagementsysteem.

5. Oliemanagementsysteem volgens een van de voorgaande conclusies, waarbij  
wanneer de pomp werkzaam is in de eerste toestand, olie overbrengbaar is van het  
30 eerste vat naar het tweede vat via een eerste leiding die is geconstrueerd en ingericht  
om te voorkomen dat olie terugstroomt in het eerste vat.

6. Oliemanagementsysteem volgens een van de voorgaande conclusies, waarbij wanneer de pomp werkzaam is in de tweede toestand, olie overbrengbaar is van het tweede vat naar het carter van de interne verbrandingsmotor via een tweede leiding die is geconstrueerd en ingericht om te voorkomen dat olie terugstroomt in het tweede vat.

5

7. Oliemanagementsysteem volgens een van de voorgaande conclusies, omvattende een derde sensor die is ingericht om een derde olieniveau in het eerste vat te meten.

10

8. Oliemanagementsysteem volgens een van de voorgaande conclusies, omvattende een elektrische stekker die is ingericht om het oliemanagementsysteem van vermogen te voorzien.

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9. Oliemanagementsysteem volgens conclusies 2-4, 7 en 8, waarbij de elektrische stekker is ingericht om een interface te verschaffen tussen het motormanagementsysteem, de eerste, tweede en/of derde sensoren.

20

10. Oliemanagementsysteem volgens een van de voorgaande conclusies, waarbij de pomp een tandradpomp is.

25

11. Werkwijze voor oliemanagement van een interne verbrandingsmotor die een carter omvat, de werkwijze omvattende:

- het vaststellen van een vooraf bepaald olieniveau in het carter van een interne verbrandingsmotor,

- het pompen van olie van een eerste vat omvattende een eerste hoeveelheid olie naar een tweede vat om tijdelijk een vooraf bepaalde tweede hoeveelheid olie op te slaan,

30

- het meten van een oliestroom naar of van het tweede vat wanneer de pomp in werking is,

- het leveren van de vooraf bepaalde tweede hoeveelheid olie van het tweede vat aan het carter van de interne verbrandingsmotor in afhankelijkheid van de gemeten oliestroom.

Fig. 1

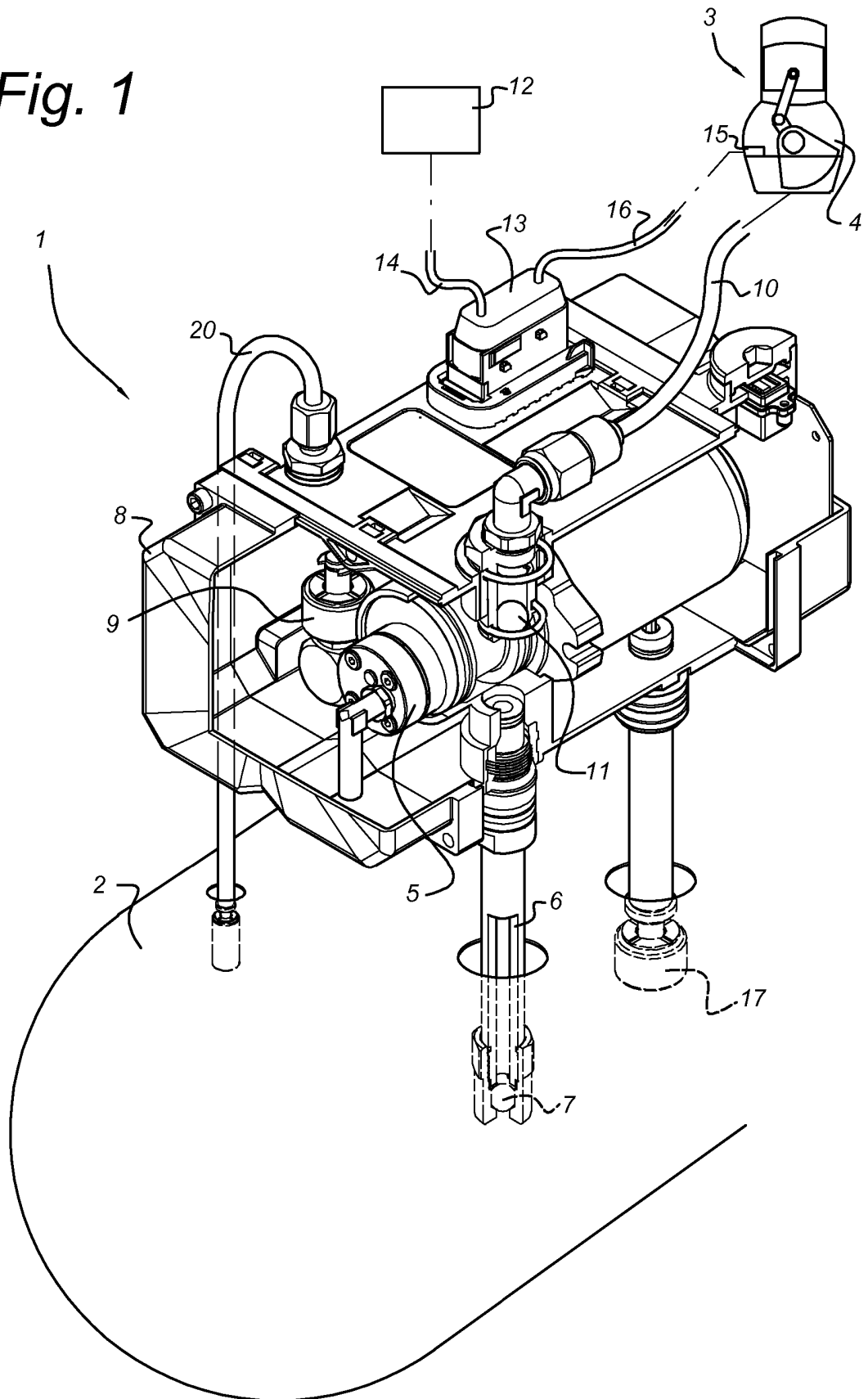
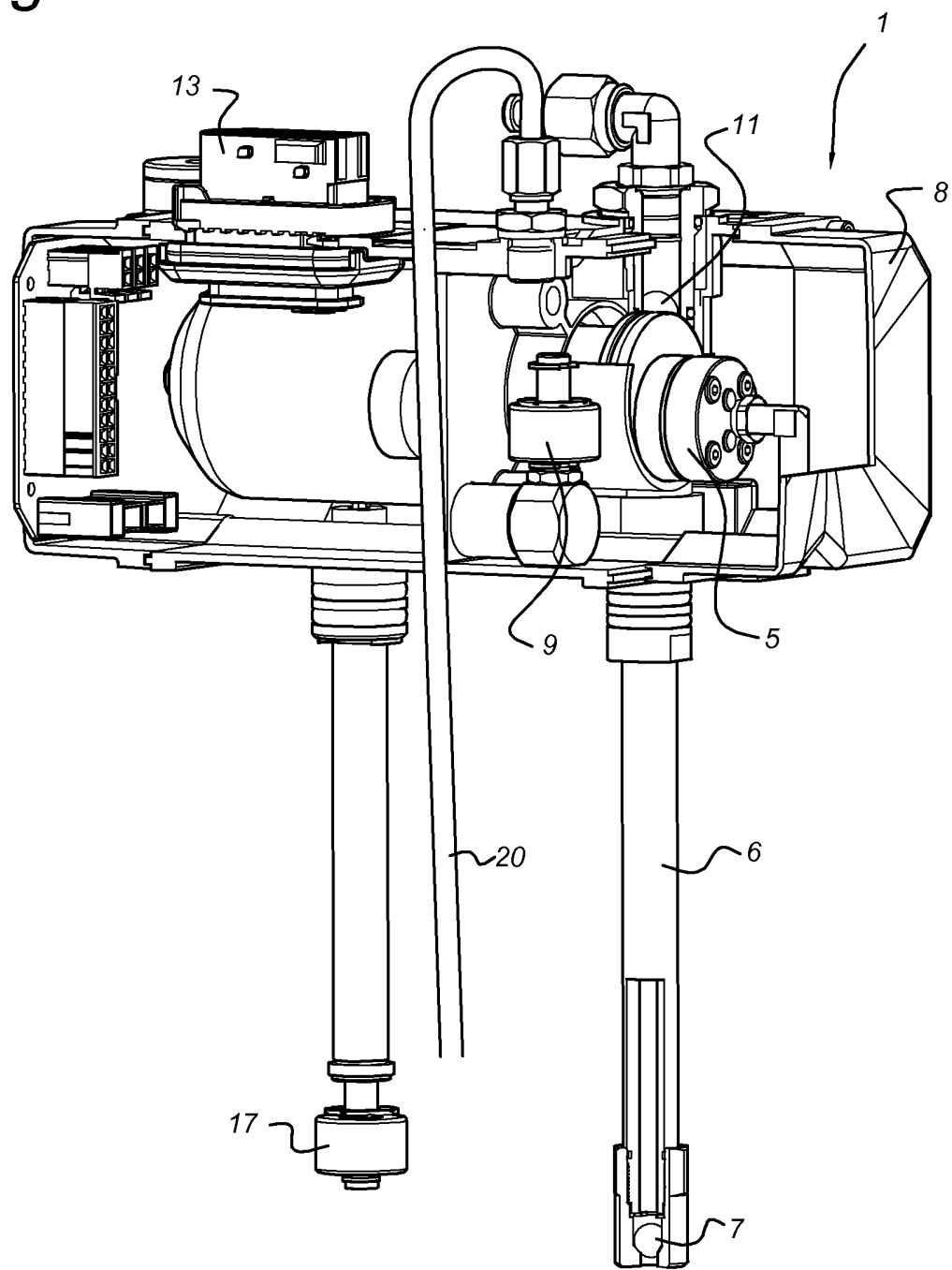


Fig. 2



# SAMENWERKINGSVERDRAG (PCT)

## RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE  <b>P6030482NL</b>
Nederlands aanvraag nr.  <b>2007335</b>	Indieningsdatum  <b>02-09-2011</b>
	Ingeroepen voorrangsdatum
Aanvrager (Naam)  <b>GROENEVELD TRANSPORT EFFICIENCY B.V.</b>	
Datum van het verzoek voor een onderzoek van internationaal type  <b>22-10-2011</b>	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr.  <b>SN 57103</b>
<b>I. CLASSIFICATIE VAN HET ONDERWERP</b> (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)	
Volgens de internationale classificatie (IPC)  <b>F01M11/06</b>	
<b>II. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK</b>	
Onderzochte minimumdocumentatie	
Classificatiesysteem	Classificatiesymbolen
<b>IPC</b>	<b>F01M</b>
Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen	
III. <input type="checkbox"/>	<b>GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES</b> (opmerkingen op aanvullingsblad)
IV. <input type="checkbox"/>	<b>GEBREK AAN EENHEID VAN UITVINDING</b> (opmerkingen op aanvullingsblad)

**ONDERZOEKSRAPPORT BETREFFENDE HET  
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND  
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar  
de stand van de techniek  
NL 2007335

A. CLASSIFICATIE VAN HET ONDERWERP INV. F01M11/06 ADD.		
Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.		
B. ONDERZOCHE GEBIEDEN VAN DE TECHNIEK		
Onderzochte minimum documentatie (classificatie gevolgd door classificatiesymbolen) F01M		
Onderzochte andere documentatie dan de minimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen		
Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden) EPO-Internal		
C. VAN BELANG GEACHTE DOCUMENTEN		
Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	FR 2 803 873 A1 (RENAULT [FR]) 20 juli 2001 (2001-07-20) * bladzijde 6, regel 6 - bladzijde 14, regel 15; figuren *	1,11
A	FR 1 095 226 A (MARLETTE) 31 mei 1955 (1955-05-31) * het gehele document *	1,11
A	JP 1 219305 A (NIPPON DENSO CO) 1 september 1989 (1989-09-01) * samenvatting *	1,11
A	US 1 401 081 A (HOWARD SIDNEY C) 20 december 1921 (1921-12-20) * het gehele document *	1,11
	-/--	
<input checked="" type="checkbox"/> Verdere documenten worden vermeld in het vervolg van vak C. <input checked="" type="checkbox"/> Leden van dezelfde octroofamilie zijn vermeld in een bijlage		
° Speciale categorieën van aangehaalde documenten *A* niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft *D* in de octrooiaanvraag vermeld *E* eerdere octrooi(aanvraag), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven *L* om andere redenen vermelde literatuur *O* niet-schriftelijke stand van de techniek *P* tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur *T* na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvraag, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding *X* de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur *Y* de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht *&* lid van dezelfde octroofamilie of overeenkomstige octrooipublicatie		
Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid 2 april 2012		Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type
Naam en adres van de instantie European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		De bevoegde ambtenaar  Vedoato, Luca

**ONDERZOEKSRAPPORT BETREFFENDE HET  
 RESULTAAT VAN HET ONDERZOEK NAAR DE STAND  
 VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Nummer van het verzoek om een onderzoek naar  
 de stand van de techniek  
 NL 2007335

C.(Vervolg). VAN BELANG GEACHTE DOCUMENTEN		
Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	DE 100 62 552 A1 (DAIMLER CHRYSLER AG [DE]) 20 juni 2002 (2002-06-20) * alineas [0026] - [0035]; figuren * -----	1,11
A	FR 504 668 A (VIGGO N LAI HANSEN [US]) 12 juli 1920 (1920-07-12) * bladzijde 1, regel 51 - bladzijde 3, regel 40; figuur 1 * -----	1,11

**ONDERZOEKSRAPPORT BETREFFENDE HET  
RESULTAAT VAN HET ONDERZOEK NAAR DE STAND  
VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE**

Informatie over leden van dezelfde octroofamilie

Nummer van het verzoek om een onderzoek naar  
de stand van de techniek

NL 2007335

In het rapport genoemd octrooigecchrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
FR 2803873	A1	20-07-2001	GEEN
FR 1095226	A	31-05-1955	GEEN
JP 1219305	A	01-09-1989	GEEN
US 1401081	A	20-12-1921	GEEN
DE 10062552	A1	20-06-2002	GEEN
FR 504668	A	12-07-1920	GEEN



Agentschap NL  
Ministerie van Economische Zaken,  
Landbouw en Innovatie

## WRITTEN OPINION

File No. SN57103	Filing date ( <i>day/month/year</i> ) 02.09.2011	Priority date ( <i>day/month/year</i> )	Application No. NL2007335
International Patent Classification (IPC) INV. F01M11/06			
Applicant GROENEVELD TRANSPORT EFFICIENCY B.V.			

This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the application
- Box No. VIII Certain observations on the application

	Examiner Vedoato, Luca
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# WRITTEN OPINION

Application number  
NL2007335

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**Box No. I Basis of this opinion**

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1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - a sequence listing
    - table(s) related to the sequence listing
  - b. format of material:
    - on paper
    - in electronic form
  - c. time of filing/furnishing:
    - contained in the application as filed.
    - filed together with the application in electronic form.
    - furnished subsequently for the purposes of search.
3.  In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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**Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty	Yes: Claims	1-11
	No: Claims	
Inventive step	Yes: Claims	1-11
	No: Claims	
Industrial applicability	Yes: Claims	1-11
	No: Claims	

2. Citations and explanations  
**see separate sheet**

**Point V - Novelty**

None of the available prior art documents discloses in its entirety the subject matter of independent claims 1 and 11 which meet therefore the novelty requirements.

Dependent claims 2 to 10 also meet the novelty requirements by virtue of their dependency.

**Point V - inventive Step**

FR 2 803 873 is considered to be the nearest state of the art and discloses an oil management system for an internal combustion engine (see in particular figure 2) comprising a first 30 and a second 18 lubricant container, the latter for temporary storage of a predetermined quantity of lubricant. A pump 50 is provided which operates for transferring lubricant to and from the second container.

The claimed device differs from the known one, in that a flow measuring unit is arranged for measuring an oil flow to and from the second container and in that the oil delivery is regulated on the base of the measured oil quantity.

The effect of the difference is that possible overflow of transferred oil is avoided.

The skilled man starting from FR 2 803 873 would not find any hint in the available prior art documents which would allow him to modify the known device in the sense of claim 1, whose subject matter meet therefore the inventivity requirements.

Same arguments apply to independent claim 11.

Dependent claims 2 to 10 are are also inventive by virtue of dependency.

**Point V - Industrial Applicability**

Claims 1 to 11 are obviously industrially applicable