APPARATUS AND METHOD

This invention relates to a device for a vehicle which may be coupled to a fluid system such as a fluid container. This invention also relates to associated modular unit, apparatus and vehicle. This invention also relates to a method for determining a property of a fluid in a fluid system such as a fluid container.

Many vehicle engines use one or more fluids for their operation. Such fluids are often liquids. For example, internal combustion engines use liquid lubricating oil. Also, electric engines use fluids which can provide heat exchange functionality, for example to cool the engine and/or to heat the engine, and/or to cool and heat the engine during different operating conditions. The heat exchange functionality of the fluids may be provided in addition to other functions (such as a primary function) which may include for example charge conduction and/or electrical connectivity. Such fluids are generally held in reservoirs associated with the engine and may require periodic replacement.

Such fluids often are consumed during operation of the engine. The properties of such fluids may also degrade with time so that their performance deteriorates, resulting in a need for replacement with fresh fluid. Such replacement may be an involved and time-consuming process. For example, replacement of engine lubricating oil in a vehicle engine usually involves draining the lubricating oil from the engine sump. The process may also involve removing and replacing the engine oil filter. Such a procedure usually requires access to the engine sump drain plug and oil filter from the underside of the engine, may require the use of hand tools and usually requires a suitable collection method for the drained lubricating oil.

Aspects and embodiments of the present disclosure are directed to a device for a vehicle which may be coupled to a fluid system such as a fluid container. Aspects and embodiments of the present disclosure are directed to a modular unit, to an apparatus and to a vehicle. Aspects and embodiments of the present disclosure are directed to a determination of a property of a fluid in a replaceable fluid container.

Aspects of the invention are recited in the independent claims and preferred features are recited in the dependent claims.

Summary

The present disclosure is directed to a device for a vehicle, comprising:

a first interface configured to couple to at least one replaceable fluid container for a vehicle comprising a battery,

the first interface comprising at least one fluid port configured to couple to at least one fluid port of the replaceable fluid container;

a second interface configured to couple to an engine of the vehicle,

the second interface comprising at least one fluid port configured to couple to at least one fluid port of a fluid circulation system of the vehicle;

a fluid path coupled to at least one fluid port of the first interface and at least one fluid port of the second interface; and

at least one electrical pump configured to be powered or driven by the battery of the vehicle and to cause fluid flow between the replaceable fluid container and the fluid circulation system through the fluid path.

The present disclosure is also directed to a modular unit for coupling at least one replaceable fluid container to a vehicle comprising a battery to an engine of the vehicle, the modular unit comprising:

a fluid path coupleable to at least one fluid port of the replaceable fluid container and at least one fluid port of a fluid circulation system of the vehicle; and

at least one electrical pump configured to be powered and/or driven by the battery of the vehicle and to cause fluid flow between the replaceable fluid container and the fluid circulation system through the fluid path.

The present disclosure is further directed to an apparatus or a vehicle comprising a battery, comprising: the device or the modular unit as disclosed herein, and optionally further comprising at least one replaceable fluid container for a vehicle.

In one aspect, the present disclosure is directed to a method of determining a characteristic associated with a fluid in a replaceable fluid container for a vehicle comprising a fluid circulation system, the method comprising:

determining, using one or more temperature sensors, a temperature associated with the fluid in the replaceable fluid container;

wherein the replaceable fluid container is coupled to a fluid path coupled to the fluid circulation system, and

wherein at least one electrical pump is configured to be powered or driven by a battery of the vehicle and to cause fluid flow between the replaceable fluid container and the fluid circulation system through the fluid path;

determining an electrical load associated with the electrical pump in a predetermined mode of operation; and

comparing the determined electrical load with at least one expected electrical load associated with the determined temperature and the predetermined mode of operation, to provide a measure of the characteristic of the fluid.

Detailed Disclosure of Embodiments

Some embodiments will now be described, by way of example only, with reference to the accompanying drawings, in which:

Claims

1. A device for a vehicle, comprising:

a first interface configured to couple to at least one replaceable fluid container for a vehicle comprising a battery,

the first interface comprising at least one fluid port configured to couple to at least one fluid port of the replaceable fluid container;

a second interface configured to couple to an engine of the vehicle,

the second interface comprising at least one fluid port configured to couple to at least one fluid port of a fluid circulation system of the vehicle;

a fluid path coupled to the at least one fluid port of the first interface and the at least one fluid port of the second interface; and

at least one electrical pump configured to be powered or driven by the battery of the vehicle and to cause fluid flow between the replaceable fluid container and the fluid circulation system through the fluid path.

2. The device of claim 1, wherein the at least one electrical pump comprises:

an electrical pump configured to cause fluid flow for fluid supply from the replaceable fluid container to the fluid circulation system; or

an electrical pump configured to cause fluid flow for fluid return from the fluid circulation system to the replaceable fluid container.

3. The device of claim 2, further comprising:

at least one heat exchanger thermally coupled to the fluid path and at least one temperature regulating system of the vehicle.

4. The device of claim 3, wherein the temperature regulating system of the vehicle is further associated with at least one of an engine cooling system and a heating, ventilating and air conditioning system of the vehicle.

5. The device of claim 3, further comprising a further electrical pump configured to be powered or driven by the battery of the vehicle and to cause a temperature regulating fluid flow through the heat exchanger.

6. The device of claim 5, wherein the temperature regulating fluid comprises one or more of: air, hydrogen, an inert gas, water, and an anti-freeze liquid.

7. The device of claim 5, wherein the further electrical pump is configured to be controlled by a controller of the vehicle.

8. The device of claim 3, further comprising:
at least one latent heat accumulator thermally coupled to the heat exchanger; or
at least one electrical heater thermally coupled to the heat exchanger.

9. The device of claim 8, wherein the at least one electrical heater is configured to be powered by the battery of the vehicle.

10. The device of claim 1, further comprising
at least one latent heat accumulator thermally coupled to the fluid path; or
at least one electrical heater thermally coupled to the fluid path.

11. The device of claim 1, wherein the electrical pump configured to cause fluid flow between the replaceable fluid container and the fluid circulation system is configured to be controlled by a controller of the vehicle or
further comprising a fluid temperature sensor configured to provide data to the controller of the vehicle.

12. The device of claim 11, wherein the controller of the vehicle comprises the electronic control unit.

13. The device of claim 1, wherein the vehicle comprises at least one electric drivetrain and the battery of the vehicle is configured to provide at least a part of an electrical power required for operation of the electric drivetrain.

14. The device of claim 13, wherein the vehicle is a hybrid vehicle, or wherein the battery of the vehicle has a nominal voltage of more than 24V.

15. The device of claim 14, wherein the nominal voltage is equal to or greater than 48V.

16. The device of claim 1, further comprising a housing:
provided with the first interface and the second interface; and
configured to house the fluid path and the electrical pump.

17. The device of claim 1, wherein the fluid in the container is one or more of:
a lubricating oil,
a de-icer,
a hydraulic fluid,
a pneumatic fluid,
a washer fluid,
a fuel additive,
a charge conduction liquid,
an electrical connectivity liquid, and
a heat exchange fluid.

18. A method of determining a characteristic of a fluid in a replaceable fluid container for a vehicle comprising a fluid circulation system, wherein the method is performed by a controller, the method comprising:

determining, using one or more temperature sensors, a temperature associated with the fluid in the replaceable fluid container;

wherein the replaceable fluid container is coupled to a fluid path coupled to the fluid circulation system, and

wherein at least one electrical pump is configured to be powered or driven by a battery of the vehicle and to cause fluid flow between the replaceable fluid container and the fluid circulation system through the fluid path;

determining an electrical load associated with the electrical pump in a predetermined mode of operation; and

comparing the determined electrical load with at least one expected electrical load associated with the determined temperature and the predetermined mode of operation, to provide a measure of the characteristic of the fluid.

19. The method of claim 18, wherein the characteristic of the fluid comprises at least one of a viscosity of the fluid, an age of the fluid, and a purity of the fluid.

20. The method of claim 19, further comprising: providing data or an indication that the viscosity of the fluid or the age of the fluid are above a predetermined threshold, when the comparing comprises determining that the determined electrical load is greater than the expected electrical load associated with the determined temperature and the predetermined mode of operation.

21. The method of claim 19, further comprising providing data indicating that a fluid change is required.

22. The method of claim 19, further comprising: providing data or an indication that the viscosity of the fluid or the purity of the fluid are below a predetermined threshold, when the comparing comprises determining that the determined electrical load is lower than the expected electrical load associated with the determined temperature and the predetermined mode of operation.

23. The method of claim 19, further comprising: providing data or an indication indicating that a running of an engine of the vehicle at a predetermined power output is required.

24. The method of claim 19, wherein the one or more temperature sensors are associated with:

the replaceable fluid container, or
the vehicle, or
a device, or
a modular unit.