FLUID METHOD AND SYSTEM

This invention relates to a method for use with a fluid container, particularly a fluid container for supplying fluid to a fluid circulation system of a vehicle engine or a vehicle.

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 compositions. Also, electric engines use fluids which can provide heat exchange functionality, for example to cool the engine, to heat the engine 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 may be generally held in containers associated with the engine.

The containers may be filled and may be recycled and/or refilled.

According to a first aspect of the present invention, there is provided a method of filling and/or draining a replaceable fluid container for an engine or vehicle, wherein the replaceable fluid container comprises a fluid reservoir and a plurality of container ports, wherein replaceable fluid container is configured to be docked with a dock associated with the vehicle or engine with the plurality of container ports positioned on and coupled to at least one port of the dock to place the fluid reservoir in fluidic communication with a fluid circulation system associated with the vehicle or engine, wherein each of the plurality of container ports has an operational function, wherein the operational function of at least one of the plurality container ports is that of being a fluid outlet port to allow the supply of fluid from the fluid reservoir, the method including: modifying the operational function of at least one of the plurality of container ports to assist filling and/or draining of the reservoir.

According to a second aspect of the present invention, there is provided a filling and/or draining interface plate configured to interface between a replaceable fluid container for a vehicle or engine and a filling and/or draining system of a replaceable fluid container management facility, wherein the replaceable fluid container comprises a fluid reservoir and a plurality of container ports, wherein the replaceable fluid container is configured to be docked with a dock associated with the vehicle or engine with the plurality of container ports

positioned on and coupled to at least one port of the dock to place the fluid reservoir in fluidic communication with a fluid circulation system associated with the vehicle or engine, wherein the filling and/or draining interface plate has a first surface configured to cooperate with at least one of the plurality of container ports of the replaceable fluid container and a second surface configured to cooperate with at least one of a plurality of filling and/or draining elements of the filling and/or draining system, the interface plate having at least one channel between the first surface and the second surface, the at least one channel being configured to fluidically couple at least one of the plurality of container ports to at least one of the plurality of filling and/or draining elements so as to modify an operational function of at least one of the plurality of ports.

According to a third aspect of the present invention, there is provided a kit comprising the above filling and/or draining interface plate and a replaceable fluid container for a vehicle or engine, wherein the replaceable fluid container comprises a fluid reservoir and a plurality of container ports, wherein the replaceable fluid container is configured to be docked with a dock associated with the vehicle or engine with the plurality of container ports positioned on and coupled to at least one port of the dock to place the fluid reservoir in fluidic communication with a fluid circulation system associated with the vehicle or engine.

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

Figure 1A shows a schematic block diagram of a first example of a method of filling and/or draining a replaceable fluid container for a vehicle or engine;

Figure 1B shows a schematic block diagram of a second example of a method of filling and/or draining a replaceable fluid container for a vehicle or engine;

Figure 2 shows a diagram of example stages of a lifecycle of a replaceable container, the example stages comprising a filling and/or draining stage;

Figure 3 shows a schematic illustration of the filling and/or draining stage of Figure 1;

Figure 4A shows a schematic illustration of an example filling and/or draining system for carrying out the filling and/or draining stage of Figure 3, with one example container;

Figure 4B shows a schematic illustration of an example filling and/or draining system for carrying out the filling and/or draining stage of Figure 3, with a plurality of example containers;

CLAIMS

1. A method of filling and/or draining a replaceable fluid container for an engine or vehicle, wherein the replaceable fluid container comprises a fluid reservoir and a plurality of container ports, wherein replaceable fluid container is configured to be docked with a dock associated with the vehicle or engine with the plurality of container ports positioned on and coupled to at least one port of the dock to place the fluid reservoir in fluidic communication with a fluid circulation system associated with the vehicle or engine, wherein each of the plurality of container ports has an operational function, wherein the operational function of at least one of the plurality container ports is that of being a fluid outlet port to allow the supply of fluid from the fluid reservoir, the method comprising:

modifying the operational function of at least one of the plurality of container ports to assist filling and/or draining of the reservoir.

2. The method of claim 1, wherein the plurality of container ports includes a fluid inlet port to allow the supply of fluid to the fluid reservoir, wherein modifying the operational function of at least one of the plurality of ports comprises modifying the operational function of at least one of the fluid inlet port or the fluid outlet port.

3. The method of claim 2, wherein modifying the operational function of at least one of the plurality of ports comprises blocking the fluid inlet port.

4. The method of claim 2, comprising opening the fluid inlet port and maintaining it open during filling and/or draining of the fluid container.

5. The method of any of claims 1 to 4, wherein the plurality of ports includes a breather port arranged to allow air to enter or exit the replaceable fluid container.

6. The method of claim 5, wherein modifying the operational function of at least one of the ports comprises blocking the breather port during filling and/or draining of the fluid reservoir.

7. The method of any preceding claim, wherein modifying the operational function of at least one of the ports comprises opening the fluid inlet port and the fluid outlet port and filling and/or draining the fluid reservoir through one of the fluid inlet port and the fluid outlet port whilst allowing air to enter or exit the replaceable fluid container through the other of the fluid inlet port and the fluid outlet port.

8. The method of any of claims 2 to 7, wherein modifying the operational function of at least one of the ports comprises filling the fluid reservoir through both the fluid inlet port and the fluid outlet port and/or draining the fluid reservoir through both the fluid inlet port and the fluid outlet port.

9. The method of claim 8, comprising filling the fluid reservoir through both the fluid inlet port and the fluid outlet port simultaneously and/or draining the fluid reservoir through both the fluid inlet port and the fluid outlet port simultaneously.

10. The method of any preceding claim, wherein modifying the operational function of at least one of the ports comprises coupling a filling and/or draining interface plate between the replaceable fluid container and a filling and/or draining system of a replaceable fluid container management facility such that the interface plate couples at least one of the plurality of ports of the replaceable fluid container to at least one of a plurality of filling and/or draining elements of the filling and/or draining system.

11. A filling and/or draining interface plate configured to interface between a replaceable fluid container for a vehicle or engine and a filling and/or draining system of a replaceable fluid container management facility, wherein the replaceable fluid container comprises a fluid reservoir and a plurality of container ports, wherein the replaceable fluid container is configured to be docked with a dock associated with the vehicle or engine with the plurality of container ports positioned on and coupled to at least one port of the dock to place the fluid reservoir in fluidic communication with a fluid circulation system associated with the vehicle or engine,

wherein the filling and/or draining interface plate has a first surface configured to cooperate with at least one of the plurality of container ports of the replaceable fluid container and a second surface configured to cooperate with at least one of a plurality of filling and/or draining elements of the filling and/or draining system, the interface plate having at least one channel between the first surface and the second surface, the at least one channel being configured to fluidically couple at least one of the plurality of container ports to at least one of the plurality of filling and/or draining elements so as to modify an operational function of at least one of the plurality of ports.

12. The filling and/or draining interface plate of claim 11, wherein the at least one channel is configured to modify the operational function of at least one of a fluid outlet port and a fluid inlet port of the plurality of ports of the replaceable fluid container.

13. The filling and/or draining interface plate of claim 12, wherein modifying the operational function of at least one of the plurality of ports comprises blocking the fluid inlet port.

14. The filling and/or draining interface plate of claim 12, comprising opening the fluid inlet port and maintaining it open during filling and/or draining of the fluid container.

15. The filling and/or draining interface plate of any of claims 12 to 14, wherein the plurality of ports includes a breather port arranged to allow air to enter or exit the replaceable fluid container.

16. The filling and/or draining interface plate of claim 15, wherein the filling and/or draining interface plate is configured to block or inhibit opening of the breather port during filling and/or draining of the fluid reservoir to avoid contamination of the breather port with the fluid.

17. The filling and/or draining interface plate of claim 16, wherein the interface plate is configured to inhibit opening of a valve of the breather port.

18. The filling and/or draining interface plate of any of claims 12 to 17, wherein the filling and/or draining interface plate is configured to couple one of the fluid inlet port and the fluid outlet port to a filling and/or draining element via the at least one channel to allow filling and/or draining the fluid reservoir through that port, and couple the other of the fluid inlet port and the fluid outlet port to air to allow air to enter or exit the replaceable fluid container through that port.

19. The filling and/or draining interface plate of any of claims 123 to 17, wherein the filling and/or draining interface plate is configured to open a valve of one of the fluid inlet port and the fluid outlet port and to couple that port to a filling and/or draining element via the at least one channel to allow filling and/or draining the fluid reservoir through that port and to open a valve of the other of the fluid inlet port and the fluid outlet port to air to allow air to enter or exit the replaceable fluid container through that port.

20. The filling and/or draining interface plate of any of claims 12 to 19, wherein the filling and/or draining interface plate is configured to couple the fluid inlet port and the fluid outlet port to at least one filling and/or draining element via the at least one channel to allow filling and/or draining of the fluid reservoir through both the fluid inlet port and the fluid outlet port.

21. The filling and/or draining interface plate of any of claims 12 to 19, wherein the filling and/or draining interface plate is configured to open a valve of each of the fluid inlet port and the fluid outlet port and to couple the fluid inlet port and the fluid outlet port to at least one filling and/or draining element via the at least one channel to allow filling and/or draining of the fluid reservoir through both the fluid inlet port and the fluid outlet port.

22. The filling and/or draining interface plate of claim 20 or 21, wherein the filling and/or draining interface plate is configured to couple the fluid inlet port and the fluid outlet port to a single filling and/or draining element via the at least one channel.

23. The filling and/or draining interface plate of claim 20 or 21, wherein the filling and/or draining interface plate has a plurality of channels and is configured to couple the fluid inlet port and the fluid outlet port to different filling and/or draining elements via respective ones of the plurality of channels.

24. A kit comprising a filling and/or draining interface plate according to any of claims 11 to 23 and a replaceable fluid container for a vehicle or engine, wherein the replaceable fluid container comprises a fluid reservoir and a plurality of container ports, wherein the replaceable fluid container is configured to be docked with a dock associated with the vehicle or engine with the plurality of container ports positioned on and coupled to at least one port of the dock to place the fluid reservoir in fluidic communication with a fluid circulation system associated with the vehicle or engine.