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Declarations under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

— *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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[Continued on next page]

(54) Title: OIL SUMP WITH INTEGRATED HEAT EXCHANGER FOR FAST WARM-UP

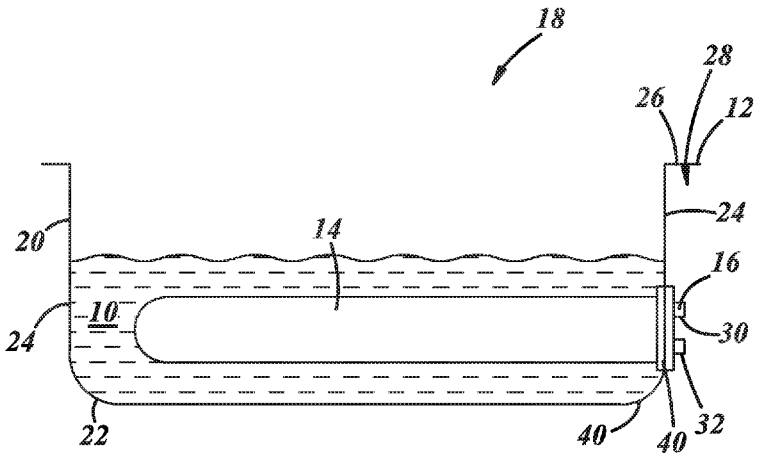


FIG. 1

(57) Abstract: The present invention generally relates to a method of heating oil prior to activating a vehicle engine which may include submerging a heat exchange device in the oil. Additionally, high temperature fluid may be pumped through the heat exchange device in order to warm the oil prior to activating the vehicle engine.

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OIL SUMP WITH INTEGRATED HEAT EXCHANGER FOR FAST WARM-UP

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims the benefit of United States Provisional Application No. 62/139,236 filed March 27, 2015.

TECHNICAL FIELD

The field to which the disclosure generally relates to includes vehicle systems including vehicle operation systems.

BACKGROUND

Vehicle systems may have various systems to warm-up an engine.

SUMMARY OF ILLUSTRATIVE VARIATIONS

A number of variations may include a vehicle system which may include an oil pan which may be operably coupled to a vehicle engine. Additionally, a heat exchange device may be disposed in the oil pan. A high temperature fluid may be pumped through the heat exchange device prior to activation of the vehicle engine.

A number of other variations may include a method which may include first providing a heat exchange device which may be disposed in an oil sump. Next, high temperature fluid may be pumped through the heat exchange device prior to a vehicle engine reaching an optimum operating temperature.

A number of other variations may include a method of heating oil prior to activating a vehicle engine which may include first submerging a heat exchange device in the oil. Next, the high temperature fluid may be pumped through the heat exchange device.

Other illustrative variations within the scope of the invention will become apparent from the detailed description provided hereinafter. It should be understood that the detailed description and specific examples, while disclosing variations within the scope of the invention, are intended for

purposes of illustration only and are not intended to limit the scope of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Select examples of variations within the scope of the invention will become more fully understood from the detailed description and the accompanying drawings, wherein:

The Figure shows a schematic illustration of an oil sump with an integrated heat exchange device according to a number of variations.

DETAILED DESCRIPTION OF ILLUSTRATIVE VARIATIONS

The following description of the variations is merely illustrative in nature and is in no way intended to limit the scope of the invention, its application, or uses.

Referring to the Figure, a method of heating oil 10 prior to activating a vehicle engine 12 may include first submerging a heat exchange device 14 in the oil 10. Additionally, the method may further include pumping high temperature fluid 16 through the heat exchange device 14 in order to warm the oil 10.

Referring again to the Figure, a vehicle system 18 may include an oil pan 20. It is contemplated that the oil pan 20 may be comprised of any material including but not limited to aluminum, steel, or a plastic polymer material as known by one of ordinary skill in the art. As illustrated in the variation shown in the Figure, the oil pan 20 may be generally rectangular in shape. It is also contemplated that the oil pan 20 may be of any other shape as known by one of ordinary skill in the art. The oil pan 20 may be constructed and arranged to be disposed in at least one of the vehicle engine or a vehicle transmission.

The variation shown in the Figure illustrates the edges 22 of the oil pan 20 being curved edges. It is also contemplated that the edges 22 of the oil pan 20 may be angular such as an acute angle or an obtuse angle as known by one of ordinary skill in the art. The oil pan 20 may also include side walls

24 which may extend upward from the edges 22. The side walls 24 may be of any height as known by one of ordinary skill in the art. As illustrated in the Figure, the side walls 24 may generally extend at least a height of the heat exchange device 14.

As additionally illustrated in the Figure, at least one side wall 24 of the oil pan 20 may include a fastening rail 26. The fastening rail 26 may be constructed and arranged to be operably coupled to the vehicle engine 12 or a vehicle transmission 28. It is also contemplated that the oil pan 20 may be operably coupled to both the engine 12 and the transmission 28 or any other vehicle portion using the fastening rail 26. The oil pan 20 may additionally be secured in the vehicle system 18 by any conventional means as known by one of ordinary skill in the art including welding, bolting, or other adhesive. It is also contemplated that the oil pan 20 may include an oil cover or other covering mechanism in order to keep the oil 10 inside of the oil pan 20 during vehicle operation.

Referring again to the Figure, the heat exchange device 14 may be operably coupled to the oil pan 20. The heat exchange device 14 may be disposed in any portion of the oil pan 20 including a lower third, a middle third or an upper third of the oil pan 20. As illustrated in the Figure, oil 10 may be disposed in the oil pan 20 such that the heat exchange device 14 is at least partially submerged in the oil 10. It is also contemplated that the heat exchange device 14 may be completely submerged in the oil 10 such that the oil 10 is completely covering the heat exchange device 14. The oil 10 may be of any type as known by one of ordinary skill in the art.

The heat exchange device 14 may be any type of heat exchange device 14 including, but not limited to, a shell-in tube heat exchanger, a double pipe heat exchanger, a plate heat exchanger, a fluid heat exchanger or any other heat exchanger as known by one of ordinary skill in the art. Moreover, the heat exchange device 14 may have a parallel flow arrangement, a counter flow arrangement, or a cross flow arrangement as desired by one of ordinary skill in the art. The heat exchange device 14 may be part of a high temperature fluid circuit which may be constructed and arranged to move fluid as desired by one of ordinary skill in the art.

As additionally illustrated in the Figure, the heat exchange device 14 may further include a fluid inlet 30 and a fluid outlet 32 portion. The fluid inlet 30 may be constructed and arranged to allow the high temperature fluid 16 to be inlet into the heat exchange device 14. Additionally, the fluid outlet 32 may be constructed and arranged to allow the high temperature fluid 16 to be removed from the heat exchange device 14. The fluid inlet 30 and the fluid outlet 32 of the heat exchange device 14 may be operably coupled to a pump. The pump may be configured to pump the high temperature fluid 16 into the fluid inlet 30, through the heat exchange device 14, and out the fluid outlet 32 in order to heat the oil 10. The high temperature fluid 16 may then be pumped to another location where it may be recycled or discharged.

Additionally, the vehicle system 18 may include a flange 40. The flange 40 may be operably coupled to the heat exchange device 14 and/or the oil pan 20. It is contemplated that the flange 40 may be integral with the heat exchange device 14 or integral with the oil pan 20. It is also contemplated that the flange 40 may be a separate piece which may be coupled to one or more of the fluid inlet 30 and fluid outlet 32 of the heat exchange device 14. It is contemplated that the flange 40 may be comprised of any material as known to one of ordinary skill in the art. Additionally, the flange 40 may be the same material as the oil pan 20 or as the heat exchange device 14 in order to encourage continuity throughout the vehicle system 18. Moreover, the flange 40 may be of any shape and size as desired by one of ordinary skill in the art. Additionally, the flange 40 may have at least one aperture which may be constructed and arranged to house the fluid inlet 30 and/or the fluid outlet 32.

Referring again to the Figure, in operation, the heat exchange device 14 may be part of a vehicle system 18 which may include a high temperature fluid circuit. The high temperature fluid 16 may be pumped through the inlet 30 of the heat exchange device 14 and may continue through the heat exchange device 14 in order to heat the oil 10 in which the heat exchange device 14 is submerged. This process may occur before the vehicle engine 12 is started and may be configured to reduce warm-up time of the oil 10. It is also contemplated that this process may occur just after the engine 12 is started in order to reduce the warm-up time of the oil 10. Additionally or alternatively, the process as described above may occur or begin while the

engine is running, for example before the engine has reached its optimal running temperature. It is contemplated that the process may occur while the engine is running and the system may be turned off once the engine reaches its normal operating temperature. It is also contemplated that the process may occur during any time including but not limited to prior to engine start up, during engine start up, during any time the engine is running, or during engine shut down. The heat exchange device 14 may be configured to heat the oil 10 which may be disposed in the oil pan 20 in order to reduce the time it takes to warm the oil 10. Once the oil 10 is warm, a vehicle passenger may enjoy all of the benefits of the vehicle.

The following description of variants is only illustrative of components, elements, acts, product and methods considered to be within the scope of the invention and are not in any way intended to limit such scope by what is specifically disclosed or not expressly set forth. The components, elements, acts, product and methods as described herein may be combined and rearranged other than as expressly described herein and still are considered to be within the scope of the invention.

Variation 1 may include a vehicle system which may comprise an oil pan which may be operably coupled to a vehicle engine. Additionally, a heat exchange device may be disposed in the oil pan. A high temperature fluid may be pumped through the heat exchange device prior to activation of the vehicle engine.

Variation 2 may include a vehicle system as set forth in Variation 1 wherein the heat exchange device may be at least partially submerged in fluid.

Variation 3 may include the vehicle system as set forth in of any of Variations 1-2 wherein the heat exchange device may be completely submerged in fluid.

Variation 4 may include the vehicle system as set forth in any of Variations 1-3 wherein the heat exchange device may be a part of a high temperature fluid circuit.

Variation 5 may include the vehicle system as set forth in any of Variations 1-4 wherein the oil pan maybe operably coupled to a vehicle transmission.

Variation 6 may include a method as set forth in any of Variations 1-5 wherein the high temperature fluid circuit may further include a flange constructed and arranged to secure the heat exchange device in the oil pan.

Variation 7 may include a method which may include first providing a heat exchange device disposed in an oil pump, and then pumping high temperature fluid through the heat exchange device prior to a vehicle engine reaching an optimum operation temperature.

Variation 8 may include a method as set forth in Variation 7 wherein the heat exchange device may be submerged in fluid.

Variation 9 may include the method as set forth in any of Variations 7-8 wherein the heat exchange device may be disposed in an oil pan.

Variation 10 may include a method as set forth in any of Variations 7-9 wherein the heat exchange device may be operably coupled to the engine.

Variation 11 may include a method as set forth in any of Variations 7-10 wherein the heat exchange device may include a high temperature fluid inlet and a high temperature fluid outlet.

Variation 12 may include a method as set forth in any of Variations 7-11 wherein the oil sump may be operably coupled to a vehicle transmission.

Variation 13 may include a method as set forth in any of Variations 7-12 wherein the high temperature fluid circuit may further include a flange which may be constructed and arranged to secure the heat exchange device in the oil pan.

Variation 14 may include a method of heating oil prior to activating a vehicle engine which may include first submerging a heat exchange device in the oil, and may then pump high temperature fluid through the heat exchange device.

Variation 15 may include a method as set forth in any of Variations 7-14 wherein the heat exchange device may be disposed in the oil pan.

Variation 16 may include a method as set forth in any of Variations 7-15 wherein the heat exchange device may be operably coupled to the engine.

Variation 17 may include a method as set forth in any of Variations 7-16 wherein the oil may be operably coupled to a vehicle transmission.

Variation 18 may include a method as set forth in any of Variations 7-17 wherein the heat exchange device may be part of a high temperature fluid circuit.

Variation 19 may include a method as set forth in any of Variations 7-18 wherein the high temperature fluid circuit may further include a flange which may be constructed and arranged to secure the heat exchange device in the oil pan.

Variation 20 may include a method as set forth in any of Variations 7-19 wherein the oil pan may further include a fastening rail for attachment to the vehicle engine.

The above description of select variations within the scope of the invention is merely illustrative in nature and, thus, variations or variants thereof are not to be regarded as a departure from the spirit and scope of the invention.

CLAIMS

What is claimed is:

1. A vehicle system comprising:

an oil pan operably coupled to a vehicle engine;

a heat exchange device disposed in the oil pan, wherein a high temperature fluid is pumped through the heat exchange device prior to activation of the vehicle engine.

2. The vehicle system of claim 1, wherein the heat exchange device is at least partially submerged in fluid.

3. The vehicle system of claim 1, wherein the heat exchange device is completely submerged in fluid.

4. The vehicle system of claim 1, wherein the heat exchange device is part of a high temperature fluid circuit.

5. The vehicle system of claim 1, wherein the oil pan is operably coupled to a vehicle transmission.

6. The vehicle system of claim 4, wherein the high temperature fluid circuit further includes a flange constructed and arranged to secure the heat exchange device in the oil pan.

7. A method comprising:

providing a heat exchange device disposed in an oil sump;

pumping high temperature fluid though the heat exchange device prior to a vehicle engine reaching an optimum operating temperature.

8. The method of claim 7, wherein the heat exchange device is submerged in fluid.

9. The method of claim 7, wherein the heat exchange device is disposed in an oil pan.

10. The method of claim 7, wherein the heat exchange device is operably coupled to the engine.

11. The method of claim 7, wherein the heat exchange device includes a high temperature fluid inlet and a high temperature fluid outlet.

12. The method of claim 7, wherein the oil sump is operably coupled to a vehicle transmission.

13. The method of claim 7, wherein the high temperature fluid circuit further includes a flange constructed and arranged to secure the heat exchange device in the oil pan.

14. A method of heating oil prior to activating a vehicle engine, comprising:

submerging a heat exchange device in the oil;

pumping high temperature fluid through the heat exchange device.

15. The method of claim 14, wherein the heat exchange device is disposed in an oil pan.

16. The method of claim 14, wherein the heat exchange device is operably coupled to the engine.

17. The method of claim 14, wherein the heat exchange device is a part of a high temperature fluid circuit.

18. The method of claim 14, wherein the oil is operably coupled to a vehicle transmission.

19. The method of claim 17, wherein the high temperature fluid circuit further includes a flange constructed and arranged to secure the heat exchange device in the oil pan.

20. The method of claim 14, wherein the oil pan further includes a fastening rail for attachment to the vehicle engine.

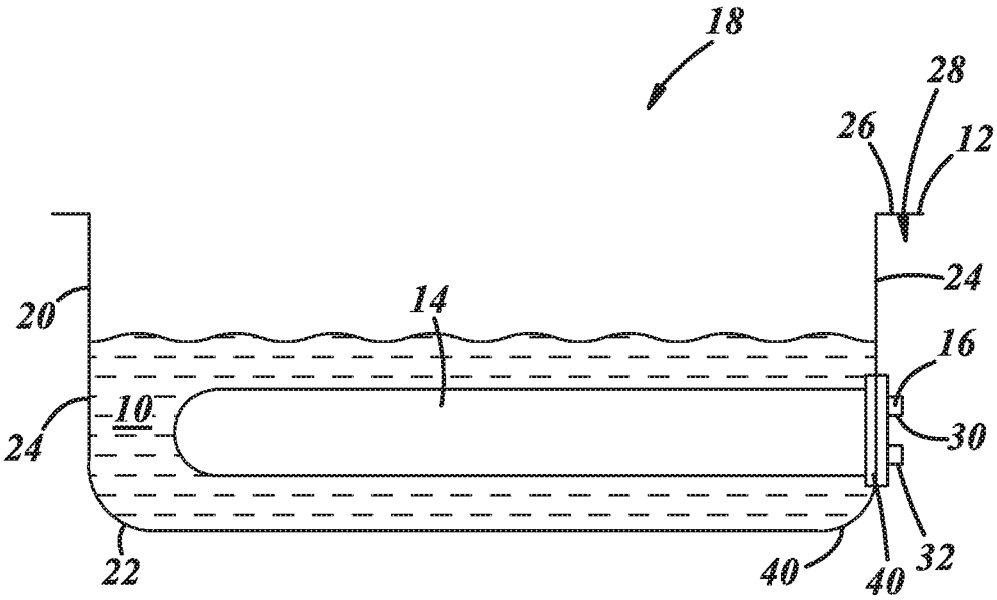


FIG. 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2016/023036

A. CLASSIFICATION OF SUBJECT MATTER

F01M 5/02(2006.01)i, F01M 11/00(2006.01)i, F16H 57/04(2010.01)i

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)
F01M 5/02; F01M 5/00; F28D 15/00; F28F 19/00; F01P 11/08; F01M 11/00; F16H 57/04

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: engine, oil, heat, exchange, warm, sump, submerge, high temperature, and flange

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 20-1998-0027987 U (HYUNDAI MOTOR COMPANY) 05 August 1998 See page 1-2 and figure 1.	1-5,7-12,14-18,20
Y		6,13,19
Y	US 2010-0212867 A1 (HOLLWECK, JOHANNES) 26 August 2010 See paragraphs [0010]-[0022], [0035] and figure 3.	6,13,19
A	JP 06-017633 A (NIPPON SOKEN INC. et al.) 25 January 1994 See paragraphs [0005]-[0010]; claim 1; and figure 2.	1-20
A	US 5408965 A (FULTON et al.) 25 April 1995 See column 1, line 49 - column 2, line 20 and claim 1.	1-20
A	JP 05-071327 A (TOYOTA MOTOR CORP.) 23 March 1993 See paragraphs [0007]-[0012] and figure 1.	1-20

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
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"P" document published prior to the international filing date but later than the priority date claimed
"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
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2016/023036

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