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(54) **Multi chamber coolant tank**

(57) A coolant tank for receiving a fluid from the cooling system of an internal combustion engine includes a pressurized tank having a pressurized reservoir configured to contain the fluid and an overflow tank integrated with the pressurized tank. The pressurized reservoir includes an inlet port configured to receive the fluid from the cooling system, an outlet port configured to direct the fluid from the pressurized reservoir to the cooling system, a fill neck in fluid communication with the pressurized reservoir, and a pressure cap removably coupled to the fill neck. The overflow tank includes an overflow reservoir maintained at atmospheric pressure and configured to receive overflow fluid from the pressurized reservoir when the liquid of the cooling system expands. At least a portion of the fill neck is positioned within the overflow reservoir.

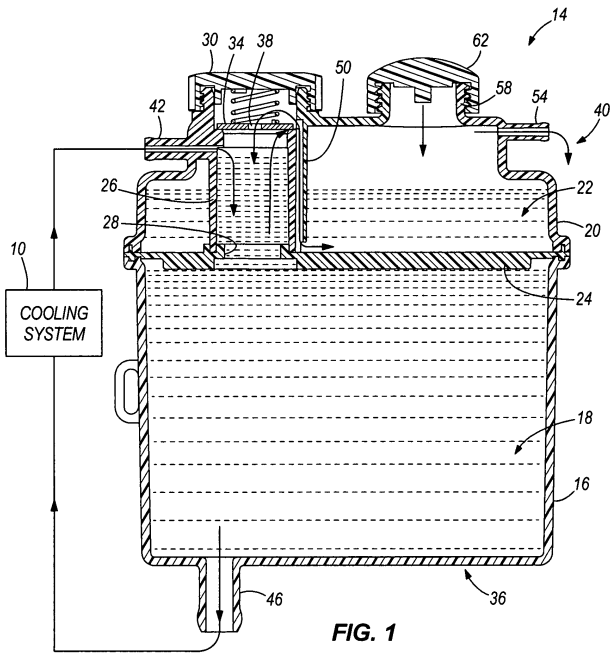

FIG. 1

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Description

[0001] The present invention relates to coolant tanks for receiving fluid from a cooling system, such as an internal combustion engine cooling system.

[0002] In one aspect, the invention provides a coolant tank for receiving a fluid from the cooling system of an internal combustion engine. The coolant tank includes a pressurized tank having a pressurized reservoir configured to contain the fluid, an inlet port in fluid communication with the pressurized reservoir and configured to direct fluid from the from the cooling system and into the pressurized reservoir, an outlet port in fluid communication with the pressurized reservoir and configured to direct the fluid from the pressurized reservoir to the cooling system, a fill neck in fluid communication with the pressurized reservoir, and a pressure cap removably coupled to the fill neck. The coolant tank also includes an overflow tank integrated with the pressurized tank. The overflow tank includes an overflow reservoir maintained at atmospheric pressure and configured to receive overflow fluid from the pressurized reservoir when the liquid of the cooling system expands, and at least a portion of the fill neck is positioned within the overflow reservoir.

[0003] The pressure cap may include: a pressure limiting valve configured to release the fluid to the overflow reservoir when the pressurized reservoir reaches a first predetermined pressure; and a check valve configured to allow the fluid to flow from the overflow reservoir to the pressurized reservoir when the pressure in the pressurized reservoir drops below a second predetermined value.

[0004] There may be provided an overflow port in fluid communication with the overflow reservoir and configured to vent the fluid to the atmosphere.

[0005] The coolant tank may further comprise a duct in fluid communication between the pressure cap and the overflow reservoir, the duct having at least a portion of a wall in common with the fill neck.

[0006] The position of the pressure cap relative to the pressure reservoir may define an upward direction.

[0007] The overflow reservoir may be positioned substantially above the pressurized reservoir.

[0008] The fill neck may extend vertically from the pressurized reservoir into the overflow reservoir.

[0009] The inlet port may be positioned near the top of the fill neck.

[0010] In another aspect the invention provides a coolant tank for receiving a fluid from the cooling system of an internal combustion engine. The coolant tank includes a pressurized tank having a pressurized reservoir configured to contain the fluid, an inlet port in fluid communication with the pressurized reservoir and configured to direct fluid from the from the cooling system and into the pressurized reservoir, an outlet port in fluid communication with the pressurized reservoir and configured to direct the fluid from the pressurized reservoir to the cooling system, a fill neck in fluid communication with the pressurized reservoir, and a pressure cap removably coupled to the fill neck. The coolant tank also includes an overflow tank integrated with the pressurized tank. The overflow tank includes an overflow reservoir maintained at atmospheric pressure and configured to receive overflow fluid from the pressurized chamber when the liquid of the cooling system expands, and a fill cap removably coupled to the overflow reservoir. The position of the fill cap relative to the overflow reservoir and the position of the pressure cap relative to the pressure reservoir define an upward direction, and at least a portion of the overflow reservoir is positioned above the pressurized reservoir.

[0011] At least a portion of the fill neck may be substantially surrounded by the overflow reservoir.

[0012] The pressure cap may include: a pressure limiting valve configured to release the fluid to the overflow reservoir when the pressurized reservoir reaches a first predetermined pressure; and a check valve configured to allow the fluid to flow from the overflow reservoir to the pressurized reservoir when the pressure in the pressurized reservoir drops below a second predetermined value.

[0013] The coolant tank may further comprise an overflow port in fluid communication with the overflow reservoir and configured to vent the fluid to the atmosphere.

[0014] The coolant tank may further comprise a duct in fluid communication between the pressure cap and the overflow reservoir.

[0015] The duct may have at least a portion of a wall in common with the fill neck.

[0016] The entire overflow reservoir may be positioned above the pressurized reservoir.

[0017] The fill neck may extend vertically from the pressurized reservoir into the overflow reservoir.

[0018] The inlet port may be positioned near the top of the fill neck.

[0019] In another aspect the invention provides a coolant tank for receiving a fluid from the cooling system of an internal combustion engine. The coolant tank includes an overflow tank including an overflow reservoir maintained at atmospheric pressure, and an overflow duct in fluid communication with the overflow reservoir. The coolant tank also includes a pressurized tank integrated with the overflow tank. The pressurized tank includes a pressurized reservoir configured to contain the fluid, an inlet port in fluid communication with the pressurized reservoir and configured to direct fluid from the cooling system and into the pressurized reservoir, an outlet port in fluid communication with the pressurized reservoir and configured to direct the fluid from the pressurized reservoir to the cooling system, a fill neck in fluid communication with the pressurized reservoir, and a pressure cap removably coupled to the fill neck. The overflow duct is integrated with the fill neck. The pressure cap includes a pressure limiting valve configured to allow the fluid to flow from the pressurized reservoir, through the fill neck, and through the overflow duct to the overflow reservoir when the pressurized reservoir reaches a first predetermined pressure, and a check valve configured to allow the fluid to flow from the overflow reservoir, through the overflow duct, and through the fill neck to the pressurized reservoir when the pressure in the pressurized reservoir drops below a second predetermined pressure.

[0020] At least a portion of the fill neck may be substantially surrounded by the overflow reservoir.

[0021] The coolant tank may further comprise an overflow port in fluid communication with the overflow reservoir and configured to vent the fluid to the atmosphere.

[0022] The position of the pressure cap relative to the pressure reservoir may define an upward direction.

[0023] The overflow reservoir may be positioned substantially above the pressurized reservoir.

[0024] The inlet port may be positioned near the top of the fill neck.

[0025] Other aspects of the invention will become apparent by consideration of the detailed description and accompanying drawings.

[0026] Fig. 1 is a schematic view of a cooling system and coolant tank according to the present invention.

[0027] Fig. 2 is an exploded view of the coolant tank of Fig. 1.

[0028] Fig. 3 is a rear perspective view of the coolant tank of Fig. 1.

[0029] Fig. 4 is a cross section view taken along line 4-4 of Fig. 3.

[0030] Before any embodiments of the invention are explained in detail, it is to be understood that the invention is not limited in its application to the details of construction and the arrangement of components set forth in the following description or illustrated in the following drawings. The invention is capable of other embodiments and of being practiced or of being carried out in various ways. 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. The use of "including," "comprising," or "having" and variations thereof herein is meant to encompass the items listed thereafter and equivalents thereof as well as additional items. Unless specified or limited otherwise, the terms "mounted," "connected," "supported," and "coupled" and variations thereof are used broadly and encompass both direct and indirect mountings, connections, supports, and couplings. Further, "connected" and "coupled" are not restricted to physical or mechanical connections or couplings.

[0031] Fig. 1 shows a schematic of a cooling system 10 including the coolant tank 14 according to the present invention. The coolant tank 14 receives a fluid from the cooling system 10, such as the cooling system of an internal combustion engine.

[0032] Figs. 2-4 show one construction of the coolant tank 14. It is to be understood that other constructions are possible within the scope of the invention, as described herein. With further reference to Fig. 2, the coolant tank 14 includes a first body portion 16, a second body portion 20, and a third body portion, or divider 24, coupled between the first and second body portions. In the illustrated construction, the body portions 16, 20 and the divider 24 are each plastic and made from a plastic-injection-molding process. In other constructions, the coolant tank 14 could be defined by a single body portion, two body portions, or more than three body portions.

[0033] In the illustrated construction, the body portions 16, 20 and the divider 24 are hotplate welded together such that they are integrated together to define the coolant tank 14. In other constructions, other welding or fastening means may be employed. The assembled coolant tank 14 includes a pressurized tank 36 and an overflow tank 40 integrated with each other, or formed as a single unit or piece. Although the body portions 16, 20 and divider 24 define features of the pressurized tank 36, the overflow tank 40, or both the pressurized tank 36 and overflow tank 40, the structure of the coolant tank 14 will be described with reference to its association with either the pressurized tank 36 or the overflow tank 40.

[0034] The pressurized tank 36 includes a pressurized reservoir 18 that is in fluid communication with the cooling system 10 and is a part of the cooling system circuit. The pressurized tank 36 also includes a fill neck 26 in direct fluid communication with the pressurized reservoir 18, and a pressure cap 30 removably coupled to the fill neck 26, preferably by way of a threaded engagement. The pressure cap 30 includes a pressure limiting valve 34 and a check valve 38, best depicted in the schematic of Fig. 1. The coolant tank 14 shown Fig. 1 is a schematic version of the cross section of the coolant tank 14 shown in Fig. 4. Particularly, a cross section of the pressure cap 30 is shown schematically in Fig. 1. The pressure limiting valve 34 and the check valve 38 will be described in greater detail below.

[0035] The fill neck 26 is fluidly separated from the overflow tank 40 by the pressure limiting valve 34 when the pressure limiting valve 34 is closed. The fill neck 26 includes a substantially cylindrical wall that extends vertically upward from an opening 28 in the divider 24 at the top of the pressurized reservoir 18, although the fill neck 26 may be non-vertical and non-cylindrical in other constructions. The fill neck 26 is substantially surrounded by the overflow tank 40. In other constructions, the fill neck 26 may be integrated with a side wall of the second body portion 20, such that a portion of the fill neck 26 is surrounded by the overflow tank 40. In preferred embodiments, the fill neck 26 is at least partially positioned within the overflow tank 40; and most preferably, the fill neck 26 is positioned substantially within the overflow tank 40.

[0036] The pressurized tank 36 includes an inlet port 42 in fluid communication with the cooling system 10 and the pressurized reservoir 18. The inlet port 42 is positioned proximate the top of the fill neck 26 and provides an inlet for the inflow of fluid to the pressurized reservoir 18 from the cooling system 10. The inlet port 42 is positioned at or near a high point in the cooling system and, likewise, at or near the top of the pressurized tank 36 and the coolant tank 14. The pressurized tank 36 also includes an outlet port 46 in fluid communication with the pressurized reservoir 18 and the cooling system 10. The outlet port 46 is positioned proximate the bottom of the pressurized reservoir 18 and provides an outlet for the outflow of fluid from the pressurized reservoir 18 to the cooling system 10. The outlet port 46 is positioned low on the pressurized tank 36 to receive fluid from a low point of the pressurized reservoir 18 and to discharge fluid to the cooling system 10.

[0037] The pressurized tank 36 includes a threaded port 48 and a float switch 52 threaded into the threaded port 48. The float switch 52 generates a warning signal when the fluid level in the pressurized reservoir 18 drops below the level of the float switch 52.

[0038] The overflow tank 40 includes an overflow reservoir 22 that is maintained at atmospheric pressure and that receives fluid from the pressurized reservoir 18 when the fluid in the pressurized reservoir 18 expands, as will be described in greater detail below. The overflow tank 40 includes an overflow duct 50 that is in fluid communication with the overflow reservoir 22. The overflow duct 50 is integrated with the fill neck 26, and shares a portion of the cylindrical wall of the fill neck 26. The overflow duct 50 is also defined by a U-shaped channel extending out from the shared portion of the fill neck 26. The overflow duct 50 provides a passageway, parallel to the fill neck 26, for fluid passing from the pressurized reservoir 18 through the fill neck 26 to the overflow reservoir 22. The overflow duct 50 also provides a passageway for fluid passing from the overflow reservoir 22 through the overflow duct 50 to the fill neck 26 and to the pressurized reservoir 18.

[0039] The overflow tank 40 includes an overflow port 54 positioned near the top of the overflow reservoir 22, providing fluid communication with the atmosphere to maintain the overflow reservoir 22 at atmospheric pressure. In addition, the overflow port 54 discharges fluid that reaches the height of the overflow port 54 within the overflow reservoir 22. The overflow tank 40 also includes a non-pressurized fill neck 58 and a fill cap 62 removably coupled thereto, preferably by way of a threaded engagement.

[0040] The position of the fill cap 62 relative to the overflow reservoir 22 and the position of the pressure cap 30 relative to the pressurized reservoir 18 define an upward direction. The pressurized reservoir 18 is positioned entirely below the overflow reservoir 22. In other constructions, the pressurized reservoir 18 is positioned substantially below the overflow reservoir 22.

[0041] With reference to Fig. 3, the coolant tank 14 includes bosses 66 for receiving fasteners to secure the tank 14 within the enclosure. In the illustrated construction, the bosses 66 are formed as a part of the pressurized tank 36; however, in other constructions, the bosses 66 may be located on any part of the tank 14.

[0042] In the illustrated construction, the coolant tank 14 is made of a transparent or semitransparent material so that the fluid level can be easily monitored, such as by markings 32 or indicia on the overflow tank 40. In other constructions, the tank 14 can be made of a non-transparent material and fluid level can be monitored using a sight glass or other suitable apparatus.

[0043] With reference to Fig. 2, the divider 24, the outlet port 46, and the threaded port 48 are integrally formed with or coupled to the first body portion 16. The divider 24, the fill neck 26, the inlet port 42, the overflow duct 50, the overflow port 54, and the non-pressurized fill neck 58 are integrally formed with or coupled to the second body portion 20.

[0044] In operation, the coolant tank 14 de-aerates coolant and provides a compact one-piece multi-chamber structure. The compact multi-chamber design having the tank inlet port 42 positioned at or near the top of the coolant tank 14 is especially useful in applications where there is relatively little vertical distance between the highest point in the engine's cooling circuit (e.g., cooling system 10) and the top of the enclosure in which the engine and cooling system 10 are housed. As illustrated by the arrows in Fig. 1 and Fig. 4, coolant and air entrained within the coolant enter the pressurized reservoir 18 by way of the inlet port 42 and fill neck 26. This reduces the velocity of the coolant such that air separates from the coolant and collects at the top of the fill neck 26, which is a high point in the cooling system 10. Coolant collects below in the pressurized reservoir 18 and exits to the lowest point of the cooling system 10 by way of the outlet port at the bottom of the pressurized reservoir 18, as indicated by the arrows in Fig. 1. When the cooling system 10 increases in temperature and pressure and reaches a first predetermined pressure, the air is released through the pressure limiting valve 34 in the pressure cap 30, i.e., the pressure limiting valve 34 opens allowing fluid to pass from the pressurized reservoir 18 and the fill neck 26, through the pressure limiting valve 34, and through the overflow duct 50 to the bottom of the overflow reservoir 22 as indicated by arrows in Fig. 1. Since the overflow reservoir 22 is open to the atmosphere, the air is purged from the system by way of the open overflow port 54, also indicated by an arrow in Fig. 1.

[0045] The overflow reservoir 22 contains additional coolant, which can be added by way of the non-pressurized fill neck 58 when the fill cap 62 is removed. When the cooling system 10 is turned off, the coolant cools and contracts creating a vacuum in the cooling system 10. When the pressure in the pressurized reservoir 18 drops below a second predetermined pressure, the check valve 38 opens allowing fluid to pass from the overflow reservoir 22 through the overflow duct 50 to the fill neck 26 and to the pressurized reservoir 18, as indicated by arrows in Fig. 1.

[0046] The cooling system 10 can also be filled by way of the fill neck 26 when the system 10 is shut down. When the cooling system 10 is shut down, the pressure cap 30 can be removed and coolant can be added directly to the pressurized reservoir 18 by way of the fill neck 26. This is useful, for example, during the initial fill, when extreme low fluid is detected (e.g., when the float switch is tripped), and when the coolant is replaced for maintenance.

[0047] Thus, the invention provides, among other things, a compact multi-chamber coolant tank. Various features and advantages of the invention are set forth in the following claims.

Claims

1. A coolant tank for receiving a fluid from the cooling system of an internal combustion engine, comprising:

   a pressurized tank including

   a pressurized reservoir configured to contain the fluid,
   an inlet port in fluid communication with the pressurized reservoir and configured to direct fluid from the from the cooling system and into the pressurized reservoir,
   an outlet port in fluid communication with the pressurized reservoir and configured to direct the fluid from the pressurized reservoir to the cooling system,
   a fill neck in fluid communication with the pressurized reservoir, and
   a pressure cap removably coupled to the fill neck; and

   an overflow tank integrated with the pressurized tank, the overflow tank including an overflow reservoir maintained at atmospheric pressure and configured to receive overflow fluid from the pressurized reservoir when the liquid of the cooling system expands, and

   wherein at least a portion of the fill neck is positioned within the overflow reservoir.

2. The coolant tank of claim 1, wherein the position of the pressure cap relative to the pressure reservoir defines an upward direction, and wherein the overflow reservoir is positioned substantially above the pressurized reservoir.

3. A coolant tank for receiving a fluid from the cooling system of an internal combustion engine, comprising:

   a pressurized tank including

   a pressurized reservoir configured to contain the fluid,
   an inlet port in fluid communication with the pressurized reservoir and configured to direct fluid from the from the cooling system and into the pressurized reservoir,
   an outlet port in fluid communication with the pressurized reservoir and configured to direct the fluid from the pressurized reservoir to the cooling system,
   a fill neck in fluid communication with the pressurized reservoir, and
   a pressure cap removably coupled to the fill neck; and

   an overflow tank integrated with the pressurized tank, the overflow tank including an overflow reservoir maintained at atmospheric pressure and configured to receive overflow fluid from the pressurized chamber when the liquid of the cooling system expands, and

   a fill cap removably coupled to the overflow reservoir, wherein the position of the fill cap relative to the overflow reservoir and the position of the pressure cap relative to the pressure reservoir define an upward direction,

   wherein at least a portion of the overflow reservoir is positioned above the pressurized reservoir.

4. The coolant tank of claim 3, wherein at least a portion of the fill neck is substantially surrounded by the overflow reservoir.

5. The coolant tank of claim 1 or claim 3, wherein the pressure cap includes:

   a pressure limiting valve configured to release the fluid to the overflow reservoir when the pressurized reservoir reaches a first predetermined pressure; and
   a check valve configured to allow the fluid to flow from the overflow reservoir to the pressurized reservoir when the pressure in the pressurized reservoir drops below a second predetermined value.

6. The coolant tank of claim 1 or claim 3, further comprising an overflow port in fluid communication with the overflow reservoir and configured to vent the fluid to the atmosphere.

7. The coolant tank of claim 1 or claim 3, further comprising a duct in fluid communication between the pressure cap and the overflow reservoir, the duct having at least a portion of a wall in common with the fill neck.

8. The coolant tank of claim 3, wherein the entire overflow reservoir is positioned above the pressurized

reservoir.

9. The coolant tank of claim 1 or claim 3, wherein the fill neck extends vertically from the pressurized reservoir into the overflow reservoir.

10. The coolant tank of claim 1 or claim 3, wherein the inlet port is positioned near the top of the fill neck.

11. A coolant tank for receiving a fluid from the cooling system of an internal combustion engine, comprising:

an overflow tank, the overflow tank including

an overflow reservoir maintained at atmospheric pressure, and
an overflow duct in fluid communication with the overflow reservoir; and a pressurized tank integrated with the overflow tank, the pressurized tank including
a pressurized reservoir configured to contain the fluid;
an inlet port in fluid communication with the pressurized reservoir and configured to direct fluid from the cooling system and into the pressurized reservoir,
an outlet port in fluid communication with the pressurized reservoir and configured to direct the fluid from the pressurized reservoir to the cooling system,
a fill neck in fluid communication with the pressurized reservoir, wherein the overflow duct is integrated with the fill neck, and
a pressure cap removably coupled to the fill neck, wherein the pressure cap includes

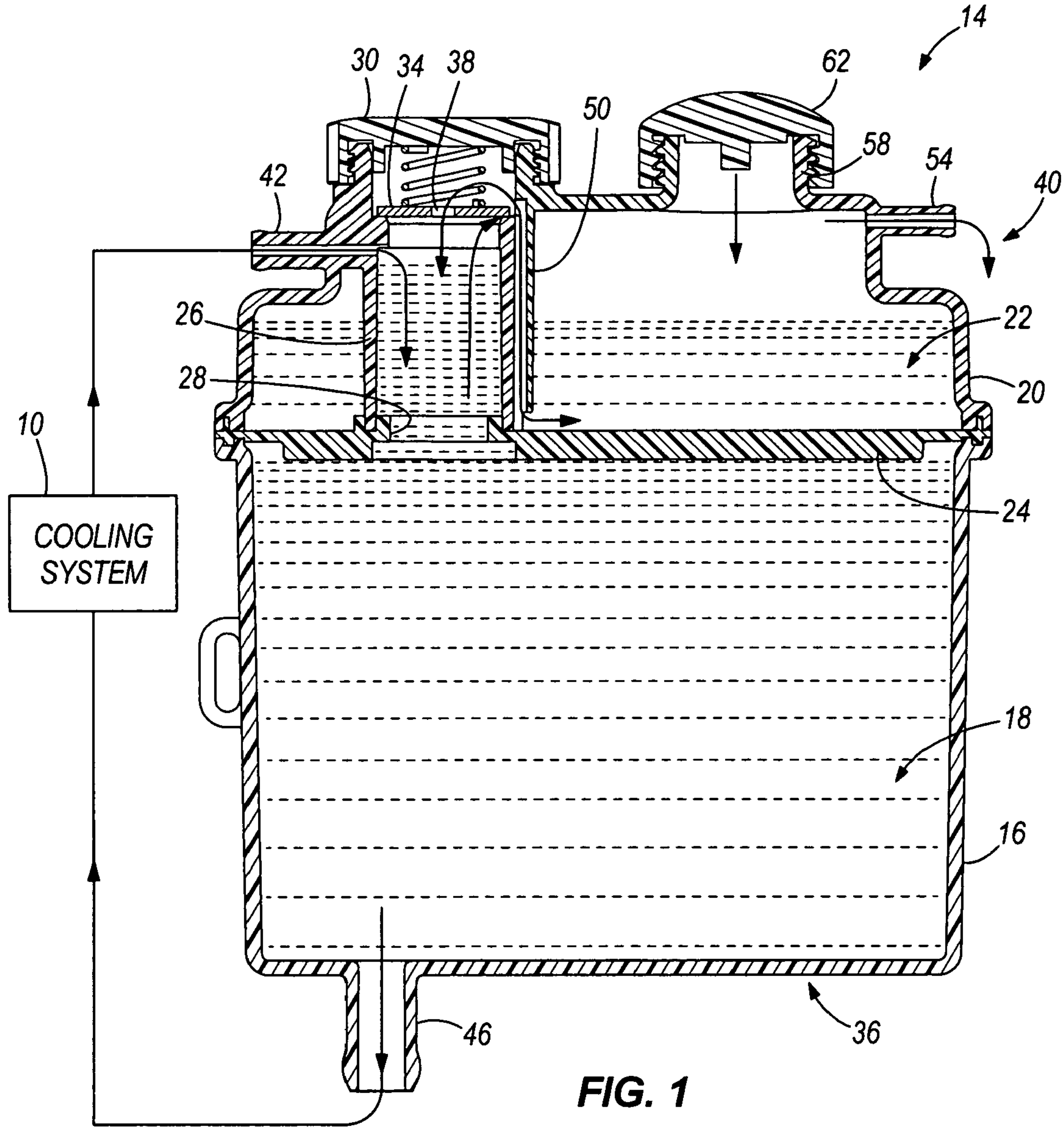
a pressure limiting valve configured to allow the fluid to flow from the pressurized reservoir, through the fill neck, and through the overflow duct to the overflow reservoir when the pressurized reservoir reaches a first predetermined pressure, and
a check valve configured to allow the fluid to flow from the overflow reservoir, through the overflow duct, and through the fill neck to the pressurized reservoir when the pressure in the pressurized reservoir drops below a second predetermined pressure.

12. The coolant tank of claim 11, wherein at least a portion of the fill neck is substantially surrounded by the overflow reservoir.

13. The coolant tank of claim 11, further comprising an overflow port in fluid communication with the overflow reservoir and configured to vent the fluid to the atmosphere.

14. The coolant tank of claim 11, wherein the position of the pressure cap relative to the pressure reservoir defines an upward direction, and wherein the overflow reservoir is positioned substantially above the pressurized reservoir.

15. The coolant tank of claim 11, wherein the inlet port is positioned near the top of the fill neck.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COOLING SYSTEM
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FIG. 1

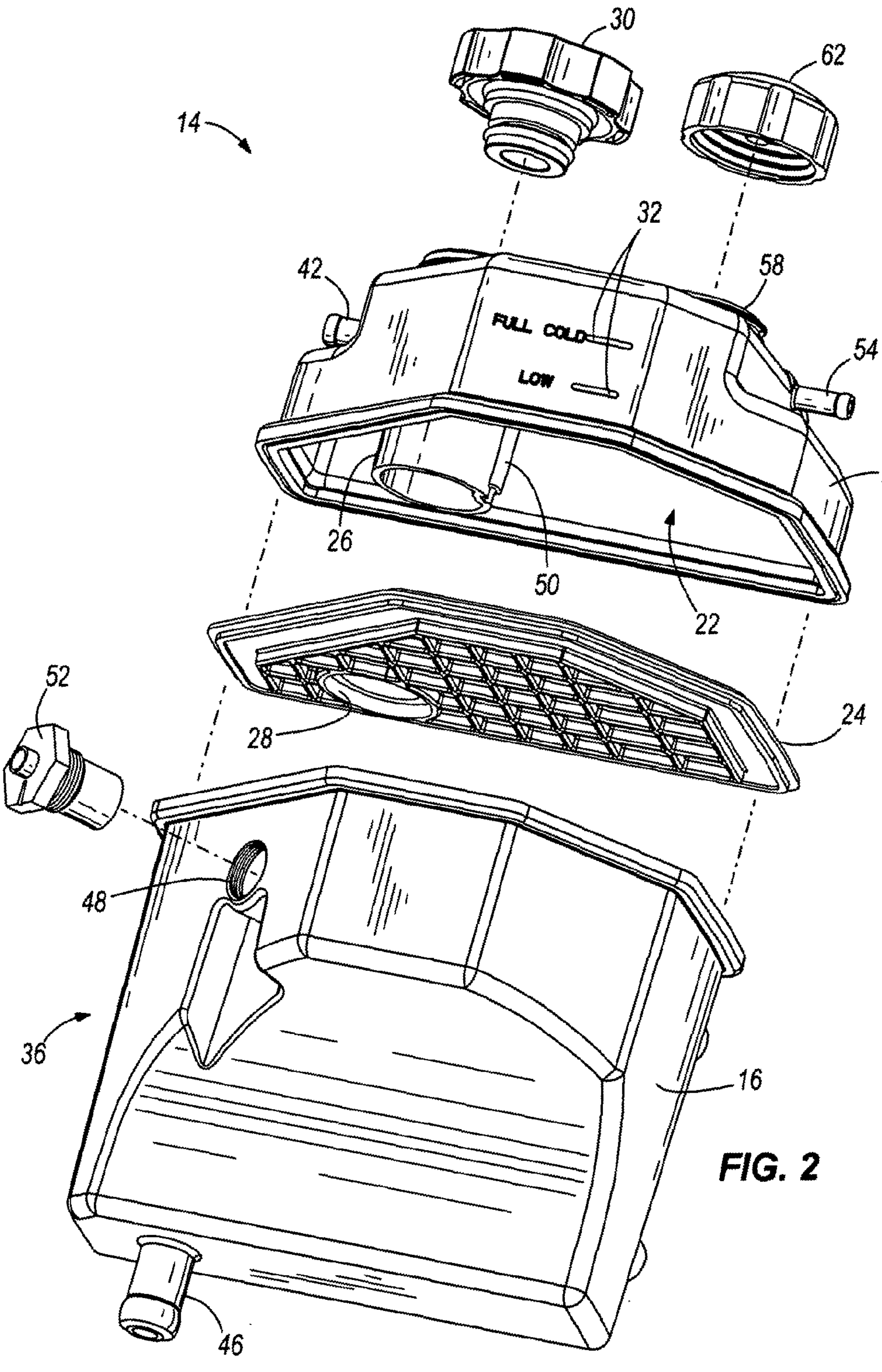

FIG. 2

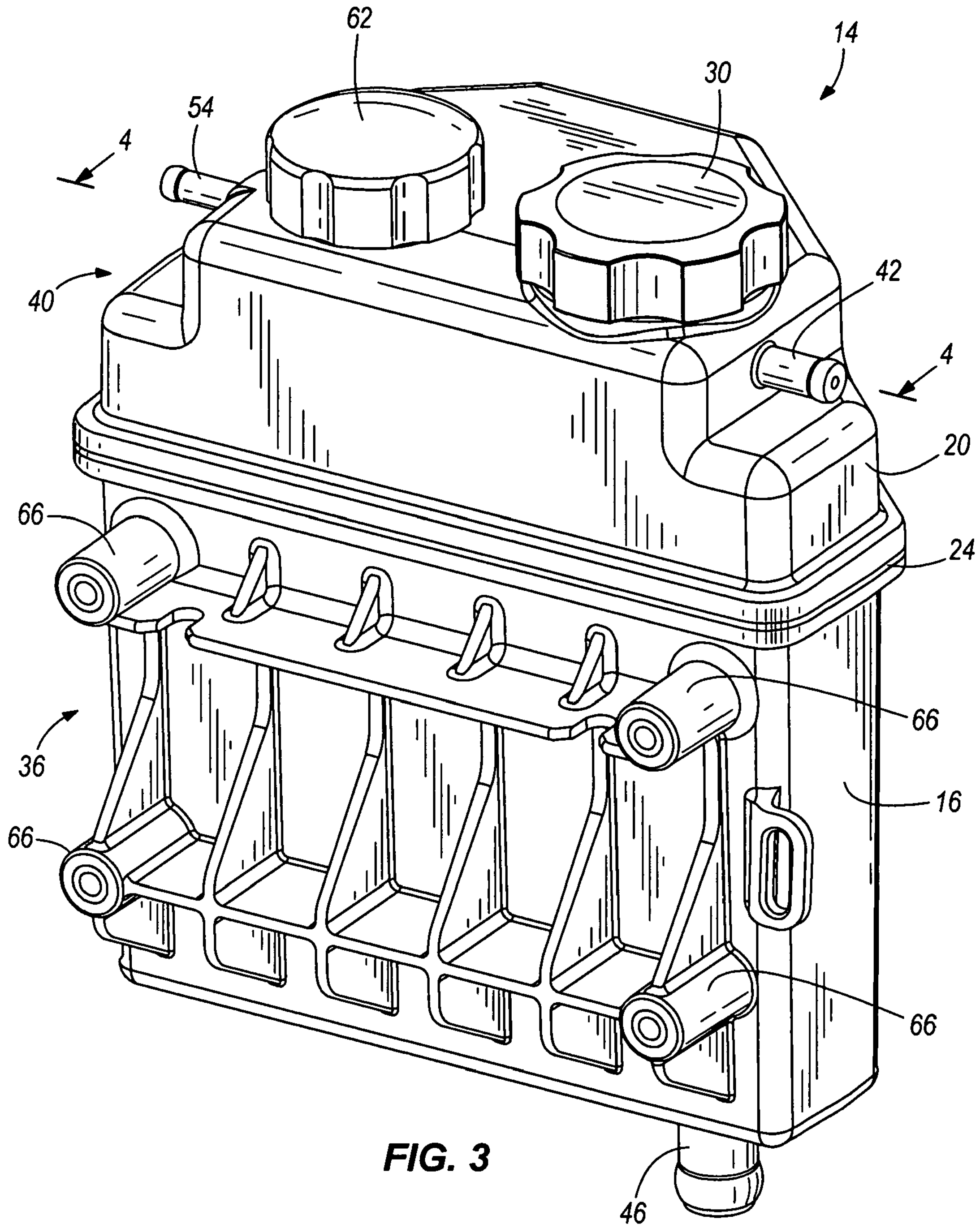

FIG. 3

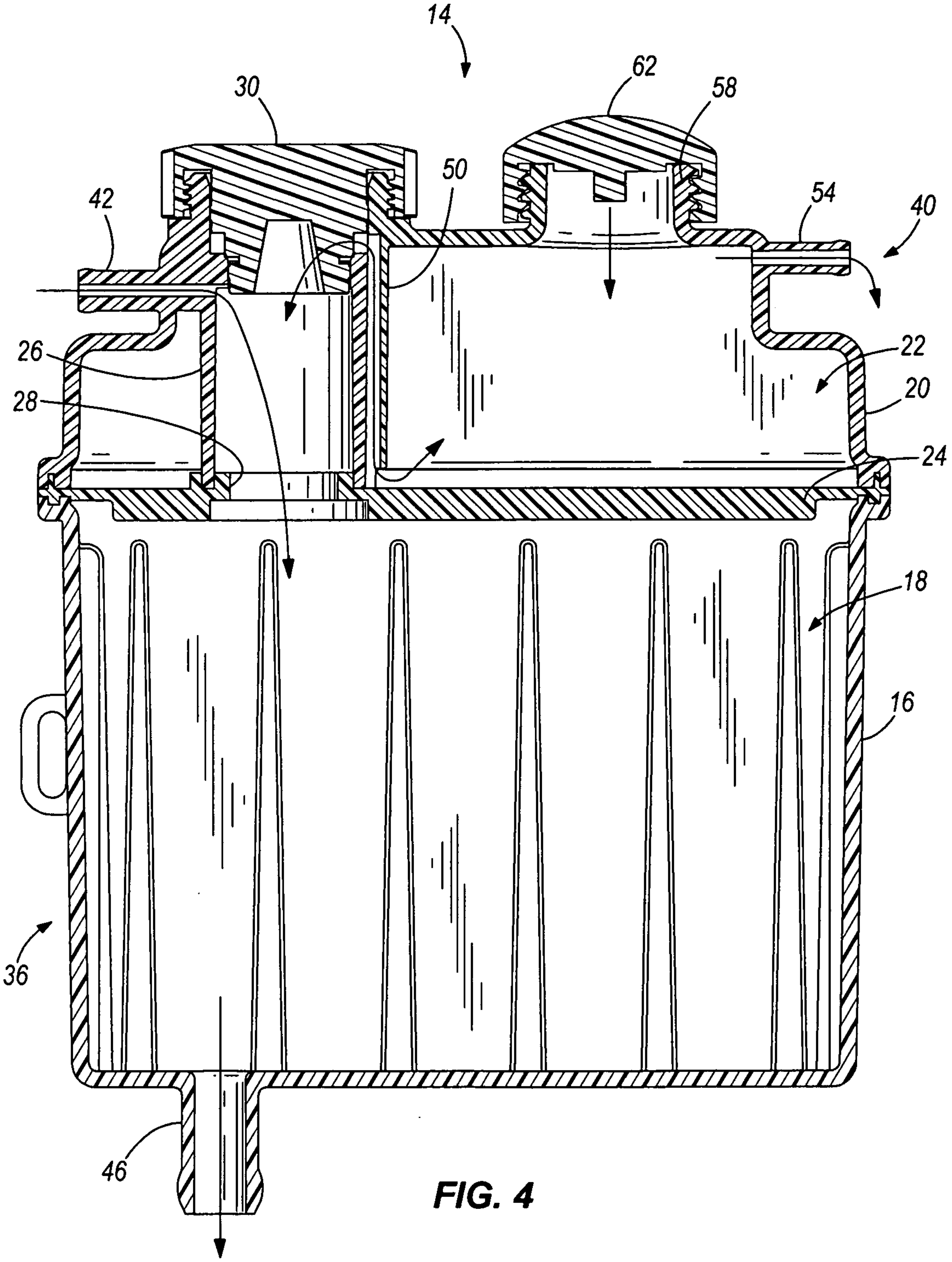

FIG. 4

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EUROPEAN SEARCH REPORT

Application Number
EP 10 25 0121

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 4 723 596 A (SPINDELBOECK DIETER [DE] ET AL) 9 February 1988 (1988-02-09) * column 3, line 23 - column 4, line 59 * * figures 1,2,4 * -----	1-15	INV. F01P11/02
A	DE 42 43 404 A1 (SAAB SCANIA AB [SE]) 1 July 1993 (1993-07-01) * the whole document * -----	1-15	
A	DE 10 2006 002459 A1 (HYUNDAI MOTOR CO LTD [KR]) 21 June 2007 (2007-06-21) * the whole document * -----	1-15	
A	DE 199 48 226 A1 (DAIMLER CHRYSLER AG [DE]) 26 April 2001 (2001-04-26) * the whole document * -----	1-15	
A	US 4 738 228 A (JENZ SIEGFRIED [DE] ET AL) 19 April 1988 (1988-04-19) * the whole document * -----	1-15	TECHNICAL FIELDS SEARCHED (IPC)
A	US 4 739 730 A (JENZ SIEGFRIED [DE] ET AL) 26 April 1988 (1988-04-26) * the whole document * -----	1-15	F01P

The present search report has been drawn up for all claims

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Place of search	Date of completion of the search	Examiner
Munich	19 July 2010	Schwaller, Vincent

CATEGORY OF CITED DOCUMENTS

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19-07-2010

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4723596 A	09-02-1988	DE 3430115 C1	30-01-1986
		EP 0171623 A2	19-02-1986
		JP 61058914 A	26-03-1986
DE 4243404 A1	01-07-1993	SE 469849 B	27-09-1993
		SE 9103820 A	24-06-1993
DE 102006002459 A1	21-06-2007	CN 1982666 A	20-06-2007
		KR 20070063149 A	19-06-2007
DE 19948226 A1	26-04-2001	NONE	
US 4738228 A	19-04-1988	BR 8604420 A	12-05-1987
		DE 3533094 A1	26-03-1987
		DE 3681386 D1	17-10-1991
		EP 0215369 A2	25-03-1987
US 4739730 A	26-04-1988	BR 8604421 A	12-05-1987
		DE 3533095 A1	19-03-1987
		EP 0215370 A2	25-03-1987

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