

(19)



(11)

EP 2 853 712 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
01.04.2015 Bulletin 2015/14

(51) Int Cl.:
F01P 11/02 (2006.01)

(21) Application number: **13195797.9**

(22) Date of filing: **05.12.2013**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA ME

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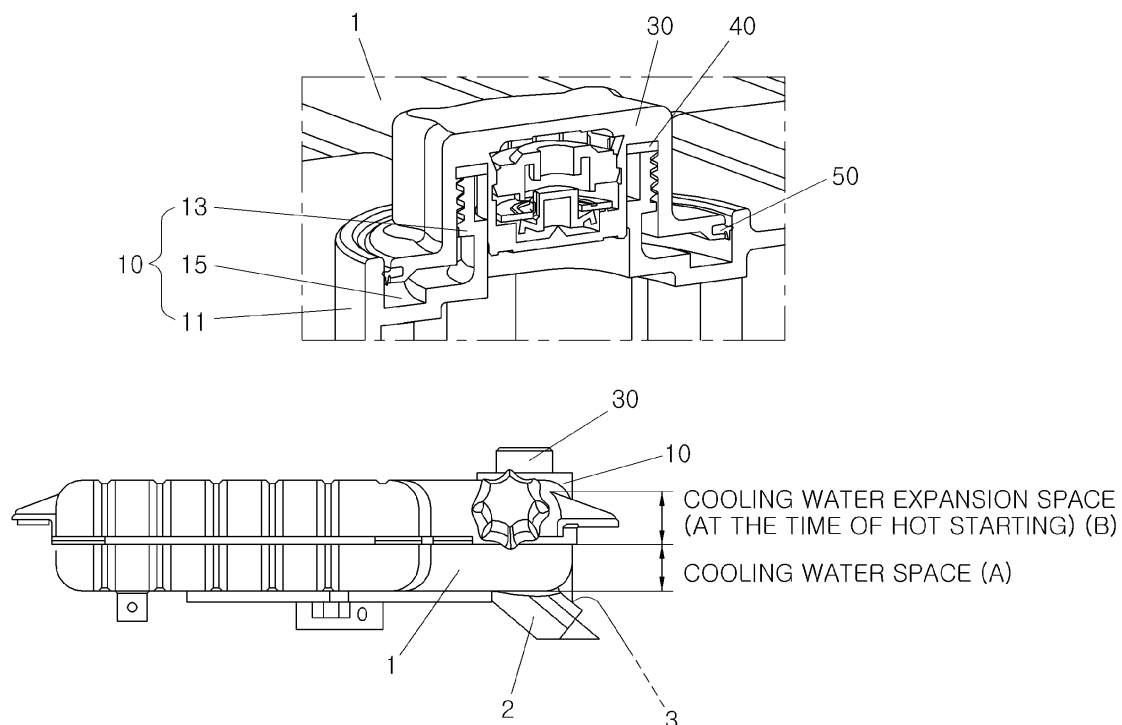
(30) Priority: **26.09.2013 KR 20130114448**

(54) Cooling water scatter preventing type surge tank

(57) A cooling water scatter preventing type surge tank assembly, may include a pressure cap, a cap coupling boss, a multi-deformation ring mounted to the pressure cap and selectively engaged to the cap coupling boss to form a receiving space between the pressure cap and the cap coupling boss, wherein the multi-deformation

ring may be configured to collect vapor or cooling water discharged through a discharge path opened when a pressure of the vapor or the cooling water rises to an allowable pressure or more, to the receiving space connected to an overflow port

FIG. 1

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims priority to Korean Patent Application No. 10-2013-0114448, filed on September 26, 2013, the entire contents of which is incorporated herein for all purposes by this reference.

BACKGROUND OF THE INVENTION

Field of the Invention

[0002] Exemplary embodiments of the present invention relate to a surge tank, and particularly, to a cooling water scatter preventing surge tank capable of basically blocking overflowing vapor and cooling water from leaking or scattering even when the surge tank is tilted.

Description of Related Art

[0003] Generally, a cooling water storing function, an air discharge operation within an engine and a radiator, and a supply of cooling water at the time of generating a vacuum pressure within the engine are performed in a surge tank.

[0004] To this end, the surge tank is provided with a cooling water supply port acting as a path through which the cooling water is supplied to the engine side at the time of exchanging the cooling water and an overflow discharge port serving as a path through which vapor and the cooling water discharged from an inside of the surge tank when a pressure rises to 0.7 bar or more are discharged to the outside and is fastened with a pressure cap so as to hold the inside of the surge tank at a constant pressure of 0.7 bar.

[0005] In particular, the pressure cap is a part which forms a pressure in a cooling system at approximately 0.7 bar so as to increase a boiling point of the cooling water and is opened when the pressure rises to 0.7 bar or more and has a structure satisfying a vapor discharge condition without discharging the cooling water within the surge tank.

[0006] However, the surge tank is installed in a vehicle which encounters various driving conditions and thus may be in a situation out of design requirements of the pressure cap. In this situation, the requirements of the pressure cap which discharges only the vapor without discharging the cooling water within the surge tank may not be satisfied.

[0007] For example, the surge tank is also tilted as much as a tilt of a vehicle which drives a sloping road having a high and long gradient condition and thus a level of the cooling water within the surge tank moves as much as the tilt, such that the cooling water pulls toward the pressure cap, thereby discharging the cooling water.

[0008] In particular, when the pressure cap is opened by the internal pressure rising to 0.7 bar or more in the

tilted state of the surge tank, the vapor and the cooling water are not normally discharged through the overflow discharge port but is discharged through the fastened portion of the pressure cap, such that a peripheral portion of the surge tank may be polluted.

[0009] The information disclosed in this Background of the Invention section is only for enhancement of understanding of the general background of the invention and should not be taken as an acknowledgement or any form of suggestion that this information forms the prior art already known to a person skilled in the art.

BRIEF SUMMARY

[0010] Various aspects of the present invention are directed to providing a cooling water scatter preventing type surge tank capable of preventing a peripheral portion of a surge tank from being polluted by blocking overflowing vapor and cooling water from leaking or scattering to the peripheral portion of the surge tank when a pressure cap is opened by an internal pressure rising to 0.7 bar or more, in particular, basically blocking the cooling water from being discharged through a fastened portion of the pressure cap even though the pressure cap is opened in a cooling water pulling state due to the tilt of the surge tank, thereby preventing the peripheral portion of the surge tank from being polluted.

[0011] Other objects and advantages of the present invention can be understood by the following description, and become apparent with reference to the embodiments of the present invention. Also, it is obvious to those skilled in the art to which the present invention pertains that the objects and advantages of the present invention can be realized by the means as claimed and combinations thereof.

[0012] In an aspect of the present invention, a cooling water scatter preventing type surge tank assembly, may include a pressure cap, a cap coupling boss, a multi-deformation ring mounted to the pressure cap and selectively engaged to the cap coupling boss to form a receiving space between the pressure cap and the cap coupling boss, wherein the multi-deformation ring is configured to collect vapor or cooling water discharged through a discharge path opened when a pressure of the vapor or the cooling water rises to an allowable pressure or more, to the receiving space connected to an overflow port, to block the receiving space from the outside by the pressure cap, and to be deformed by the pressure cap to perform sealing processing on the receiving space double.

[0013] The multi-deformation ring is deformed by a fastening force of the pressure cap with the receiving space in a state in which an end of the multi-deformation ring is inserted into the pressure cap to perform the sealing processing on the receiving space double.

[0014] The end of the multi-deformation ring is fitted in a ring groove which is formed in the pressure cap.

[0015] The pressure cap is provided with a concentric

flange in which the ring groove is formed to be assembled with the multi-deformation ring, wherein the concentric flange is disposed concentrically on a pressure cap body of the pressure cap which is fastened with a filler neck protruding from the cap coupling boss in the receiving space communicating with an inside of a surge tank, and wherein the pressure cap body is provided with a gasket which selectively contacts a top surface of the filler neck.

[0016] The multi-deformation ring is made of a plate rubber material.

[0017] The multi-deformation ring may include a circular body having an annular ring shape and configured to be coupled to the pressure cap, and a deformation protrusion and a deformation wing which are integrally formed at an outer edge of the circular body, and wherein the deformation wing and the deformation protrusion each seal the receiving space by contacting an outer wall of the cap coupling boss to perform the sealing processing on the receiving space double, wherein the receiving space is enclosed by the outer wall of the cap coupling boss and the pressure cap.

[0018] The deformation wing protrudes outside of an outer edge of the circular body in a horizontal section of the circular body and the deformation protrusion protrudes downward from the deformation wing.

[0019] The deformation protrusion and the deformation ring each may have a triangular shape.

[0020] The receiving space communicating with the inside of a surge tank is formed between a filler neck and an outer wall, the filler neck being formed to protrude from the cap coupling boss and configured to be fastened with the pressure cap along with a gasket, and the outer wall protruding from the cap coupling boss to enclose the filler neck in a concentric circle to form the receiving space therebetween.

[0021] The outer wall, the filler neck, and the receiving space are formed as a space in which the cooling water is expanded, in the surge tank.

[0022] An inner peripheral surface of the pressure cap is provided with a female screw and an outer peripheral surface of the filler neck is provided with a male screw such that the pressure cap is configured to be selectively engaged with the filler neck.

[0023] The methods and apparatuses of the present invention have other features and advantages which will be apparent from or are set forth in more detail in the accompanying drawings, which are incorporated herein, and the following Detailed Description, which together serve to explain certain principles of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

FIG. 1 illustrates a configuration of a cooling water scatter preventing type surge tank in accordance with an exemplary embodiment of the present inven-

tion.

FIG. 2 is a detailed configuration diagram of a multi-deformation ring which is applied to a pressure cap of the cooling water scatter preventing type surge tank in accordance with the exemplary embodiment of the present invention.

FIG. 3 is an assembled state diagram of the pressure cap of the cooling water scatter preventing type surge tank in accordance with the exemplary embodiment of the present invention and the multi-deformation ring.

FIG. 4 is an operation state diagram of the pressure cap depending on a change in posture of the surge tank in accordance with the exemplary embodiment of the present invention.

FIG. 5 is an operation state diagram of the multi-deformation ring within the pressure cap at the time of the change in posture of the surge tank in accordance with the exemplary embodiment of the present invention.

[0025] It should be understood that the appended drawings are not necessarily to scale, presenting a somewhat simplified representation of various features illustrative of the basic principles of the invention. The specific design features of the present invention as disclosed herein, including, for example, specific dimensions, orientations, locations, and shapes will be determined in part by the particular intended application and use environment.

[0026] In the figures, reference numbers refer to the same or equivalent parts of the present invention throughout the several figures of the drawing.

DESCRIPTION OF SPECIFIC EMBODIMENTS

[0027] Reference will now be made in detail to various embodiments of the present invention(s), examples of which are illustrated in the accompanying drawings and described below. While the invention(s) will be described in conjunction with exemplary embodiments, it will be understood that the present description is not intended to limit the invention(s) to those exemplary embodiments. On the contrary, the invention(s) is/are intended to cover not only the exemplary embodiments, but also various alternatives, modifications, equivalents and other embodiments, which may be included within the spirit and scope of the invention as defined by the appended claims.

[0028] FIG. 1 illustrates a configuration of a cooling water scatter preventing type surge tank in accordance with an exemplary embodiment of the present invention.

[0029] As illustrated in FIG. 1, a surge tank 1 is formed to have a shape having an inner space filled with cooling

water, in which a bottom surface portion thereof is integrally provided with an overflow port 3 along with a cooling water supply port 2, and a top surface portion thereof is integrally provided with a cap coupling boss 10 with which the pressure cap 30 is screw fastened.

[0030] Generally, based on a section height of the surge tank 1, a lower space forming a bottom portion is divided into a cooling water space A filled with cooling water, while an upper space forming a top portion is divided into a cooling water expansion space B which is a spare space in which the cooling water may be expanded at the time of a temperature rise of an engine (at the time of hot starting).

[0031] Therefore, the cooling water supply port 2 is disposed at the bottom portion of the surge tank 1, while the cap fastening boss 10 is disposed at the top portion of the surge tank 1, and the overflow port 3 communicates with the cap fastening boss 10 while being disposed at the bottom portion of the surge tank 1, such that vapor or overflowing cooling water may be discharged outside of the surge tank 1 when the pressure cap 30 is opened.

[0032] The cap fastening boss 10 is configured to include an outer wall 11 which protrudes from the top surface of the surge tank 1 to form an opened inner space, a filler neck 13 which protrudes in a hollow pipe form so as to communicate with an inside of the surge tank 1 in the inner space of the outer wall 11, and a receiving space 15 in which the filler neck 13 having a concentric circle shape is formed at the outer wall 11.

[0033] The outer wall 11 protrudes a relatively lower height than the filler neck 13 and an outer peripheral surface of the filler neck 13 is provided with a male screw to be screw fastened with a female screw of the pressure cap 30.

[0034] In particular, the receiving space 15 forms a path through which when the pressure cap 30 is opened, the vapor or the overflowing cooling water may be discharged outside of the surge tank 1 and has at least one stepped section structure to more relieve the flow of cooling water.

[0035] The pressure cap 30 is provided with the female screw which is inserted into an inlet of the filler neck 13 and is screw fastened with the male screw of the filler neck 13 and the inside of the pressure cap 30 is provided with a groove into which a gasket 40 is inserted.

[0036] Further, the pressure cap 30 is provided with a multi-deformation ring 50 along with the gasket 40 to increase sealability of the inside of the surge tank 1, and in particular, when the pressure cap 30 is opened, a phenomenon that the vapor or the overflowing cooling water scatters through the cap fastening boss 10 in the surge tank 1 is prevented.

[0037] The gasket 40 adheres to the top surface of the filler neck 13 in the state in which the pressure cap 30 is fastened with the filler neck 13 to provide the sealability, thereby forming a pressure of 0.7 bar.

[0038] The multi-deformation ring 50 adheres to an inner surface of the outer wall 11 in the state in which the

pressure cap 30 is fastened with the filler neck 13 to prevent the vapor or the overflowing cooling water from scattering through the cap fastening boss 10 in the surge tank 1 when the pressure cap 30 is opened.

[0039] Meanwhile, FIG. 2 illustrates a detailed configuration of the multi-deformation ring 50 which is separated from the pressure cap 30.

[0040] As illustrated in FIG. 2, the multi-deformation ring 50 is configured to include a circular body 51 having an annular ring shape and a circular protruding body 53 which is integrally formed at an outer edge of the circular body 51 to expand a diameter of the circular body 51.

[0041] The circular body 51 is inserted into the pressure cap 30 to serve to assemble the multi-deformation ring 50 with the pressure cap 30.

[0042] The circular protruding body 53 is configured to include a deformation wing 53-2 which protrudes outside of an edge of the circular body 51 from a horizontal section of the circular body 51 and a deformation protrusion 53-1 which protrudes downwardly from the deformation wing 53-2 to expand a width thickness of the circular body 51.

[0043] The deformation protrusion 53-1 performs a primary sealing operation so as to be adhere between the pressure cap 30 and the outer wall 11 of the cap fastening boss 10, in particular, an operation of more improving an adhesion by receiving a pressure generated from the inside of the pressure cap 30 so as to be pushed to the outside.

[0044] The deformation wing 53-2 performs a secondary sealing operation to adhere between the pressure cap 30 and the outer wall 11 of the cap fastening boss 10 above the deformation protrusion 53-1.

[0045] In particular, the deformation protrusion 53-1 and the deformation wing 53-2 have a triangular shape and have a high deformation degree at the time of adhering to a contact portion, thereby more strengthening the adhesion. However, the shape of the deformation protrusion 53-1 and the deformation wing 53-2 is not limited to the triangular shape.

[0046] In accordance with the exemplary embodiment of the present invention, the deformation wing 53-2 and the deformation protrusion 53-1 are made of a plate rubber material and formed to have a relatively thinner thickness, thereby maximizing a sealing operation while minimizing a friction force at the time of tightening the pressure cap 30. Here, the minimization of the friction force means the state in which the sealing action of the gasket 40 against the filler neck 13 at the time of tightening the pressure cap 30 is not reduced. However, the overall multi-deformation ring 50 may be made of the plate rubber material.

[0047] Meanwhile, FIG. 3 illustrates the assembled state of the pressure cap and the multi-deformation ring.

[0048] As illustrated in FIG. 3, the pressure cap 30 is provided with a concentric flange 31 which is disposed between the outer wall 11 and the filler neck 13 and the concentric flange 31 is further provided with a ring groove

31-1 which is depressed along an edge of the concentric flange 31, such that the multi-deformation ring 50 may be inserted into the concentric flange 31.

[0049] Therefore, when the pressure cap 30 is fastened with the cap fastening boss 10, the multi-deformation ring 50 is in contact with an inner peripheral surface of the outer wall 11 while the pressure cap 30 goes down along the filler neck 13, and the fastening of the pressure cap 30 is further progressed, such that the primary sealing by the deformation protrusion 53-1 and the secondary sealing by the deformation wing 53-2 may be formed.

[0050] In particular, the deformation protrusion 53-1 suffers from a position deformation a-1 to be lifted up from an initial position a, such that an adhering state Sa to the inner peripheral surface of the outer wall 11 may be more strengthened. Further, the deformation wing 53-2 suffers from a position deformation b-1 to be lifted up from an initial position b, such that an adhering state Sb to the inner peripheral surface of the outer wall 11 may be more strengthened.

[0051] Meanwhile, FIG. 4 illustrates an operation state of the pressure cap depending on a change in posture of the surge tank in accordance with the exemplary embodiment of the present invention.

[0052] As illustrated in FIG. 4, the surge tank 1 is tilted due to a vehicle which drives a sloping road having a high and long gradient condition and cooling water 100 filled in the surge tank 1 is in a pulled state toward the pressure cap 30 due to the sloping road and in this state, the pressure cap 30 is in an opened state due to a pressure of 0.7 bar or more.

[0053] However, the pressure cap 30 is further provided with the multi-deformation ring 50 which forms a double sealing, such that the vapor or the overflowing cooling water discharged from the inside of the surge tank 1 due to the opening of the pressure cap 30 may be collected to the receiving space 15 and then the flow of vapor or overflowing cooling water discharged through the overflow port 3 connected to the receiving space 15 may be smoothly performed.

[0054] As such, the state formed by the action of the multi-deformation ring 50 is illustrated in FIG. 5.

[0055] As illustrated in FIG. 5, the vapor or the overflowing cooling water discharged from the inside of the surge tank 1 due to the opening of the pressure cap 30 is collected to the receiving space 15, but the deformation protrusion 53-1 performing the primary sealing operation of the multi-deformation ring 50 prevents the cooling water from splashing.

[0056] Therefore, the cooling water blocked by the deformation protrusion 53-1 may not move toward the deformation wing 53-2 and even though the cooling water moving toward the deformation wing 53-2 is present, the cooling water is again blocked by the deformation wing 53-2 and thus does not deviate from the cap fastening boss 10.

[0057] In particular, the sealing operation is more strengthened by the adhering state Sa due to the deformation of the deformation protrusion 53-1 and the adhering state Sb due to the deformation of the deformation wing 53-2, such that the movement of the cooling water may be completely blocked.

5 [0058] Therefore, even though the vehicle drives the sloping road having the high and long gradient condition, the phenomenon that in the surge tank 1, the peripheral portion of the pressure cap 30 is polluted with the cooling water may be basically prevented.

10 [0059] As described above, the cooling water scatter preventing type surge tank in accordance with the exemplary embodiment of the present invention further includes the multi-deformation ring 50 which collects the vapor or the cooling water, which is discharged through the discharge path opened when the pressure rises to an allowable pressure or more, to the receiving space 15 connected to the overflow port 3, blocks the receiving space 15 from the outside by the pressure cap 30, and is deformed by the pressure cap 30 to perform the sealing processing on the receiving space 15 double, such that the leaking or scattering of the overflowing vapor and cooling water to the peripheral portion of the surge tank may be blocked when the pressure cap is opened by the internal pressure rising to 0.7 bar or more. In particular, even though the pressure cap is opened in the cooling water pulling state due to the tilt of the surge tank, the multi-deformation ring 50 basically blocks the cooling water from being discharged through the fastened portion of the pressure cap, thereby preventing the peripheral portion of the surge tank from being polluted.

15 20 25 30 [0060] In accordance with the exemplary embodiments of the present invention, the pressure cap holding 0.7 bar and opened at the time of 0.7 bar or more and satisfying the condition of preventing the cooling water from scattering to the outside at the time of pulling the cooling water while satisfying the vapor discharge condition without discharging the cooling water may be applied to the surge tank, thereby remarkably improving the performance of the surge tank.

35 40 [0061] Further, in accordance with the exemplary embodiments of the present invention, even though the pressure cap is opened in the cooling water pulling state due to the tilt of the surge tank, the pressure cap may basically block the cooling water from scattering to the outside, thereby preventing the peripheral portion of the surge tank from being polluted.

45 50 [0062] In addition, in accordance with the exemplary embodiments of the present invention, the scattering of the cooling water to the outside is basically blocked in the cooling water pulling state due to the tilt of the surge tank by applying the multi-deformation ring inserted into the pressure cap, such that there is little increase in additional cost due to the change in design of the pressure cap and the surge tank and the productivity is remarkably improved due to the improvement in the performance of the surge tank.

55 [0063] In addition, in accordance with the exemplary embodiments of the present invention, even though the

vehicle is driven in any driving condition, the pollution of the peripheral portion of the surge tank due to the scattering of the cooling water to the outside is prevented, thereby preventing the customer claim from occurring due to the surge tank.

[0064] For convenience in explanation and accurate definition in the appended claims, the terms "upper", "lower", "inner" and "outer" are used to describe features of the exemplary embodiments with reference to the positions of such features as displayed in the figures.

[0065] The foregoing descriptions of specific exemplary embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teachings. The exemplary embodiments were chosen and described in order to explain certain principles of the invention and their practical application, to thereby enable others skilled in the art to make and utilize various exemplary embodiments of the present invention, as well as various alternatives and modifications thereof. It is intended that the scope of the invention be defined by the Claims appended hereto and their equivalents.

Claims

1. A cooling water scatter preventing type surge tank assembly, comprising:
 - a pressure cap;
 - a cap coupling boss;
 - a multi-deformation ring mounted to the pressure cap and selectively engaged to the cap coupling boss to form a receiving space between the pressure cap and the cap coupling boss;
 - wherein the multi-deformation ring is configured to collect vapor or cooling water discharged through a discharge path opened when a pressure of the vapor or the cooling water rises to an allowable pressure or more, to the receiving space connected to an overflow port, to block the receiving space from the outside by the pressure cap, and to be deformed by the pressure cap to perform sealing processing on the receiving space double.
2. The cooling water scatter preventing type surge tank assembly of claim 1, wherein the multi-deformation ring is deformed by a fastening force of the pressure cap with the receiving space in a state in which an end of the multi-deformation ring is inserted into the pressure cap to perform the sealing processing on the receiving space double.
3. The cooling water scatter preventing type surge tank assembly of claim 2, wherein the end of the multi-

deformation ring is fitted in a ring groove which is formed in the pressure cap.

4. The cooling water scatter preventing type surge tank assembly of claim 3, wherein the pressure cap is provided with a concentric flange in which the ring groove is formed to be assembled with the multi-deformation ring, wherein the concentric flange is disposed concentrically on a pressure cap body of the pressure cap which is fastened with a filler neck protruding from the cap coupling boss in the receiving space communicating with an inside of a surge tank, and wherein the pressure cap body is provided with a gasket which selectively contacts a top surface of the filler neck.
5. The cooling water scatter preventing type surge tank assembly of claim 1, wherein the multi-deformation ring is made of a plate rubber material.
6. The cooling water scatter preventing type surge tank assembly of claim 5, wherein the multi-deformation ring includes:

a circular body having an annular ring shape and configured to be coupled to the pressure cap; and

a deformation protrusion and a deformation wing which are integrally formed at an outer edge of the circular body, and

wherein the deformation wing and the deformation protrusion each seal the receiving space by contacting an outer wall of the cap coupling boss to perform the sealing processing on the receiving space double, wherein the receiving space is enclosed by the outer wall of the cap coupling boss and the pressure cap.

7. The cooling water scatter preventing type surge tank assembly of claim 6, wherein the deformation wing protrudes outside of an outer edge of the circular body in a horizontal section of the circular body and the deformation protrusion protrudes downward from the deformation wing.
8. The cooling water scatter preventing type surge tank assembly of claim 7, wherein the deformation protrusion and the deformation ring each have a triangular shape.
9. The cooling water scatter preventing type surge tank assembly of claim 1, wherein the receiving space communicating with the inside of a surge tank is formed between a filler neck and an outer wall, the filler neck being formed to protrude from the cap coupling boss and configured to be fastened with the

pressure cap along with a gasket, and the outer wall protruding from the cap coupling boss to enclose the filler neck in a concentric circle to form the receiving space therebetween.

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10. The cooling water scatter preventing type surge tank assembly of claim 9, wherein the outer wall, the filler neck, and the receiving space are formed as a space in which the cooling water is expanded, in the surge tank.

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11. The cooling water scatter preventing type surge tank assembly of claim 9, wherein an inner peripheral surface of the pressure cap is provided with a female screw and an outer peripheral surface of the filler neck is provided with a male screw such that the pressure cap is configured to be selectively engaged with the filler neck.

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FIG.1

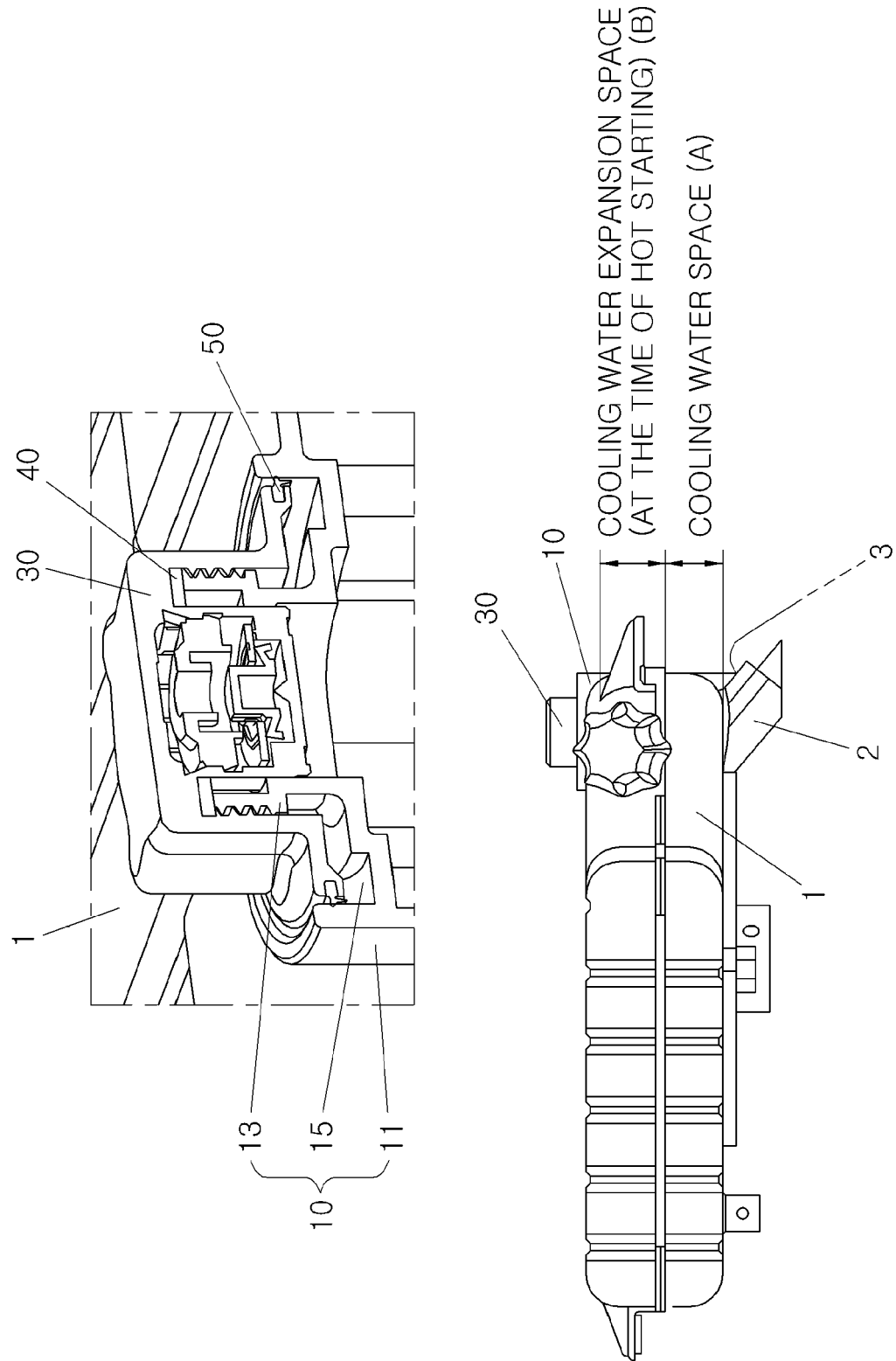


FIG.2

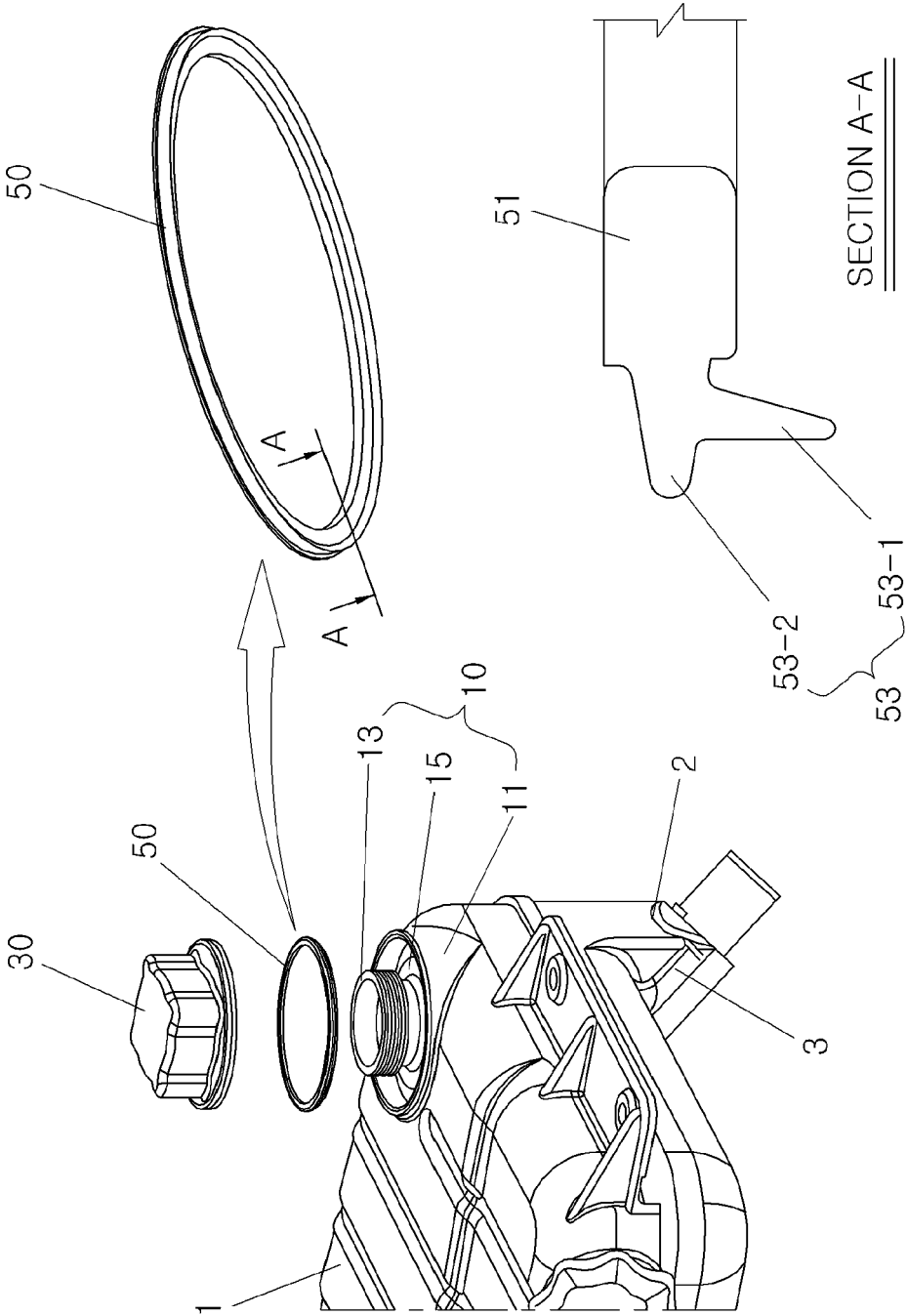


FIG.3

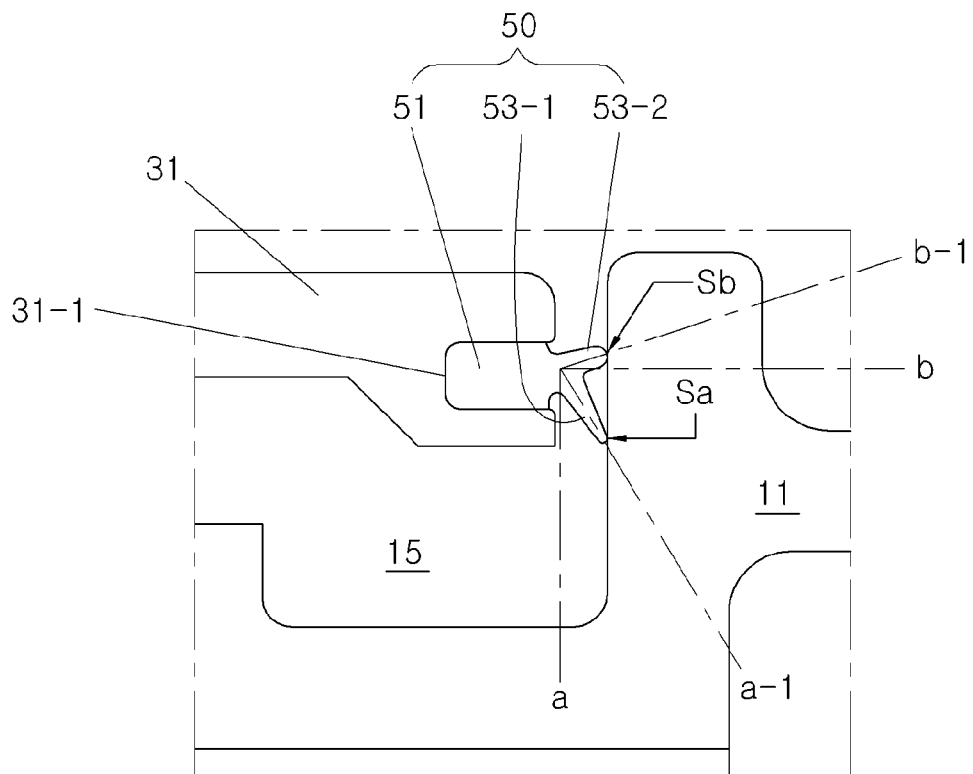
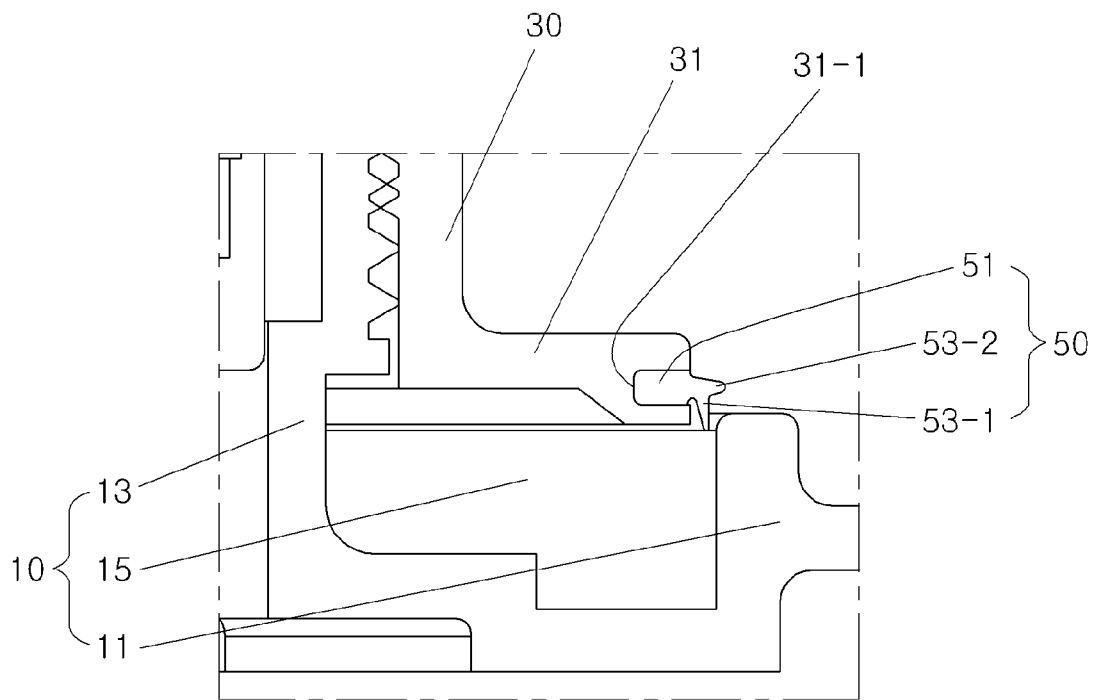
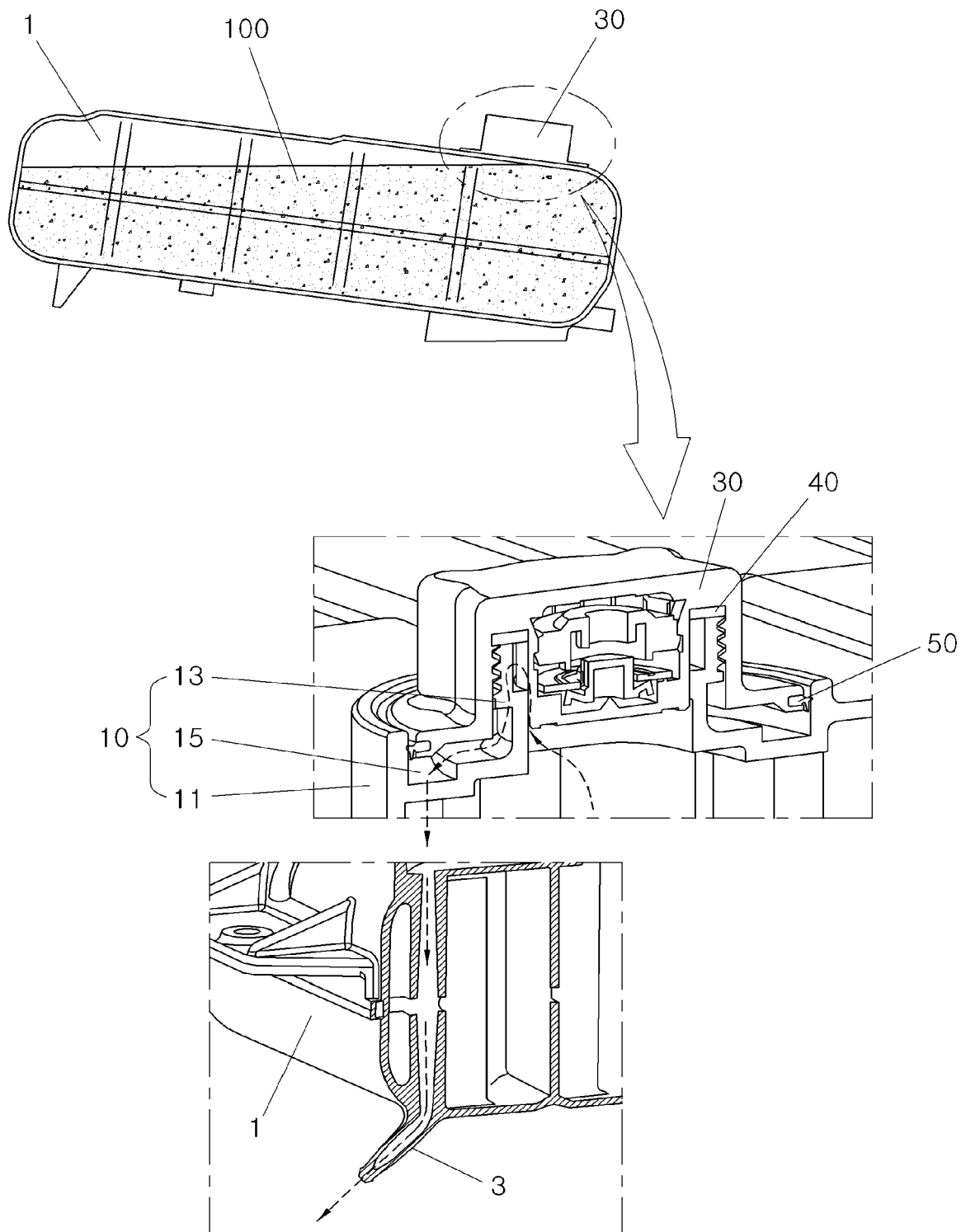
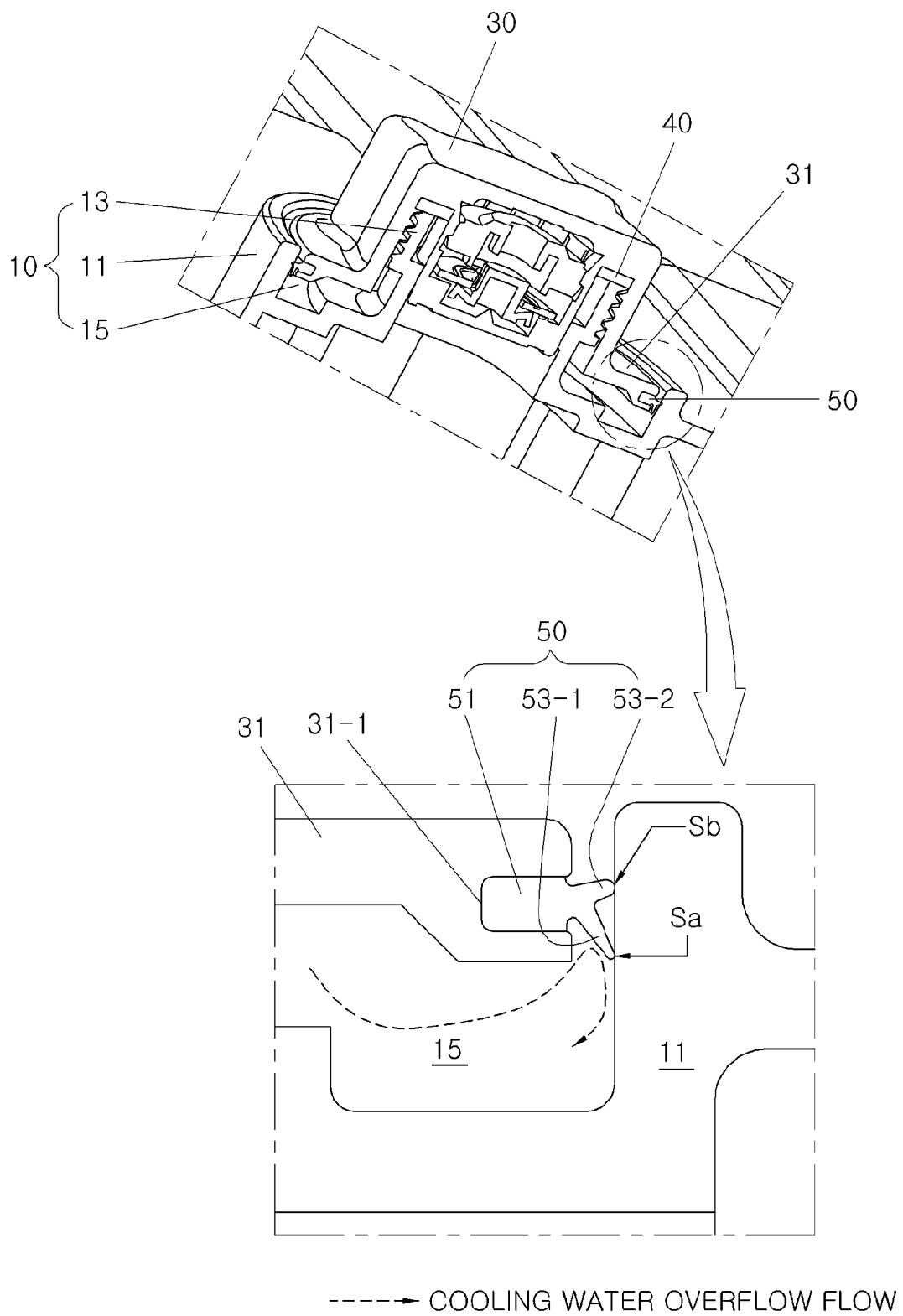


FIG.4



-----> COOLING WATER DISCHARGE PATH

FIG.5





EUROPEAN SEARCH REPORT

Application Number
EP 13 19 5797

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		19 February 2015	Matray, J
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T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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