(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
3 March 2016 (03.03.2016)

WIPO | PCT

(10) International Publication Number
WO 2016/032016 A1

(51) International Patent Classification:
B60K 15/03 (2006.01) *B60K 15/04* (2006.01)

(21) International Application Number:
PCT/KR2014/007934

(22) International Filing Date:
26 August 2014 (26.08.2014)

(25) Filing Language: English

(26) Publication Language: English

(71) Applicant: **VOLVO CONSTRUCTION EQUIPMENT AB** [SE/SE]; S-631 85 Eskilstuna (SE).

(72) Inventor; and

(71) Applicant *(for IN only)*: **CHAUHAN, Ashok** [IN/KR]; (Sinchon-dong, Samsung Apt) Na-301, 106, Sinchon-ro, Seongsan-gu, Changwon-si, Gyeongsangnam-do 642-943 (KR).

(74) Agent: **YOON, Eui-Seoup**; 17F., 430, Eonju-ro, Gangnam-gu, Seoul 135-080 (KR).

(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JP, KE, KG, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

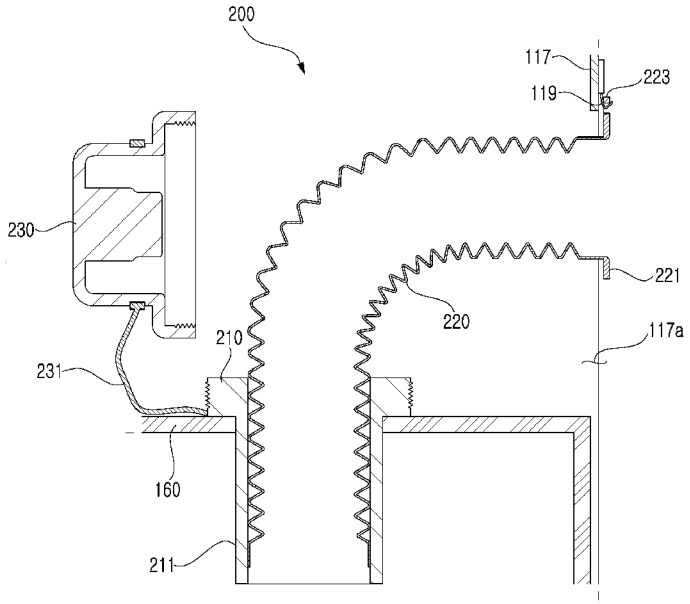
(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

WO 2016/032016 A1

(54) Title: FLEXIBLE FUEL FILLING CAP OF FUEL TANK



(57) Abstract: The present invention relates to a fuel filling cap of a fuel tank with improved accessibility to a fuel supply pipe without lowering space efficiency associated with installation of the fuel tank in construction equipment comprising compactors or road rollers. The present invention provides a fuel filling cap, mounted in a fuel tank of construction equipment, for opening and closing a fuel filling inlet, comprising: a base plate, which is coupled to a top surface of the fuel tank and comprises a support pipe introduced into the fuel tank in its center; a flexible pipe, wherein its bottom end is coupled to an inner wall of the support pipe of the base plate, and the flexible pipe is formed of bellows longitudinally flexible by an outer force and comprises a flange located in the top of the base plate in its top end; and a cap member detachably coupled to the base plate.

Description

Title of Invention: FLEXIBLE FUEL FILLING CAP OF FUEL TANK

Technical Field

[1] The present invention relates to a fuel filling cap of a fuel tank, more specifically, a fuel filling cap, which is mounted in a fuel tank of construction equipment comprising compactors and road rollers, for opening and closing a fuel filling inlet.

Background Art

[2] A compactor or a road roller is construction equipment used to compact the ground or asphalt pavement using a heavy-weight drum in the construction of roads.

[3] The compactor or the road roller typically comprises a vehicle body equipped with a cabin seat and an engine, a front drum installed in the front of the vehicle body, and a rear drum installed in the rear of the vehicle body.

[4] The vehicle body is loaded with a Roll-Over Protective Structure (ROPS) in order to safely protect a driver sitting in the cabin seat when the compactor or the road roller rolls over.

[5] Further, a vibrating means for generating a vibratory force to the ground or an asphalt pavement through an eccentric rotation is mounted inside at least one of the front drum and the rear drum.

[6] A ballast for applying a weight to a drum is installed in one side of at least one of the front drum and the rear drum. The inside of the ballast is filled with water, sand or metal scrap to increase the weight.

[7] Further, a drum cooling means is installed in the bottom of the ballast. The drum cooling means sprays cooling water on at least one of the front drum and the rear drum to cool the rum and simultaneously remove asphalt particles from the drum surface.

[8] As the above-mentioned members are compactly disposed in the vehicle body of the construction equipment comprising compactors and road rollers, there is no enough space to install a fuel tank. For this reason, a fuel tank of the construction equipment comprising compactors and road rollers is installed under the cabin seat in order to increase space efficiency.

[9] In case of such a fuel tank, a fuel filling inlet should be formed in a direction perpendicular to a top surface of the fuel tank for peak filling of fuel. Further, a top outer surface of the fuel tank of the vehicle body is covered with an outer cover, and a cutout is formed in the outer cover so that a nozzle of a fuel supply pipe is accessible to the fuel filling inlet.

[10] Accordingly, a fuel filling cap for opening and closing the fuel inlet of the fuel tank

is located inside the outer cover without being exposed to the outside of the vehicle body, and the fuel supply pipe is accessible to the fuel filling inlet through the cutout when fuel is supplied.

[11] However, in a conventional construction equipment comprising compactors and road rollers, a fuel filling inlet of a fuel tank is formed in a perpendicular direction, whereas a fuel supply pipe is entered from the lateral side through a cutout of the outer cover and is inserted into the fuel filling inlet when fuel is supplied. Thus, it was not easy to insert a nozzle of the fuel supply pipe into the fuel filling inlet of the fuel tank.

[12] Further, in order to solve such problem, the outer cover comprising a cutout should be formed to be in an excessively high position, which results in lowering space efficiency associated with installation of the fuel tank.

Disclosure of Invention

Technical Problem

[13] The present invention relates to a fuel filling cap of a fuel tank to improve accessibility to a fuel supply pipe without lowering space efficiency associated with installation of the fuel tank in construction equipment comprising compactors and road rollers.

Solution to Problem

[14] The present invention discloses a flexible fuel filling cap, which is mounted in a fuel tank of construction equipment, for opening and closing a fuel filling inlet, characterized by comprising: a base plate, which is coupled to a top surface of the fuel tank and is equipped with a support pipe, introduced into the fuel tank, in the center; a flexible pipe, wherein a bottom end is coupled to an inner wall of the support pipe of the base plate, and the flexible pipe is formed of bellows longitudinally flexible by an outer force and comprises a flange located in the top of the base plate in its top end; and a cap member detachably coupled to the base plate.

[15] According to a preferred feature of the present invention, the base plate is welded to the top surface of the fuel tank, and the support pipe extends perpendicularly downwards or slantly downwards.

[16] According to a preferred feature of the present invention, the flange of the flexible pipe has a width less than the base plate.

[17] According to a preferred feature of the present invention, the flange of the flexible pipe comprises a holding member to enable an operator to easily hold.

[18] According to a preferred feature of the present invention, the flexible pipe is manufactured with rubber materials or chemically resistant resin materials.

[19] According to a preferred feature of the present invention, the cap member is screw-coupled to the base plate.

[20] According to a preferred feature of the present invention, the cap member is connected to the base plate by a connection member. The connection member comprises a strip member connected to the base plate and a ring member integrated with the strip member and, to which the cap member is rotatably coupled.

[21] According to a preferred feature of the present invention, the fuel tank is installed under the cabin seat of the construction equipment. The top outer surface of the fuel tank of the vehicle body in the construction equipment is covered with an outer cover in which a cutout is formed. The flange of the flexible pipe is withdrawn to the outside through the cutout of the outer cover when fuel is supplied by the fuel supply pipe.

[22] According to a preferred feature of the present invention, a flange support member to which a flange of the flexible pipe is detachably coupled is mounted on an outer surface of the outer cover adjacent to the cutout.

[23] According to a preferred feature of the present invention, the construction equipment is a compactor or a road roller.

Advantageous Effects of Invention

[24] The present disclosure is advantageous in that the accessibility to a fuel supply pipe is improved without lowering space efficiency associated with installation of the fuel tank in construction equipment comprising compactors and road rollers.

Brief Description of Drawings

[25] FIG. 1 is a perspective view of the entire construction equipment comprising a flexible fuel filling cap of a fuel tank according to an example of the present invention.

[26] FIG. 2 is an enlarged view of a flexible fuel filling cap of a fuel tank according to an example of the present invention installed to the construction equipment according to FIG. 1.

[27] FIG. 3 is an exploded perspective view of a flexible fuel filling cap of a fuel tank according to an example of the present invention.

[28] FIG. 4 illustrates a cross-sectional structure of a flexible fuel filling cap of a fuel tank according to an example of the present invention.

[29] FIG. 5 illustrates a state of using a flexible fuel filling cap of a fuel tank when fuel is filled according to an example of the present invention.

[30] FIG. 6 illustrates a cross-sectional structure of a flexible fuel filling cap of a fuel tank when fuel is filled according to an example of the present invention.

Mode for the Invention

[31] Reference will now be made in detail to embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings. While the present disclosure will be described in conjunction with the following embodiments, it will be understood that they are not intended to limit the present disclosure to these em-

bodiments alone. On the contrary, the present disclosure is intended to cover alternatives, modifications, and equivalents which may be included within the spirit and scope of the present disclosure as defined by the appended claims. Furthermore, in the following detailed description of the present disclosure, numerous specific details are set forth in order to provide a thorough understanding of the present disclosure. However, embodiments of the present disclosure may be practiced without these specific details.

[32]

[33] FIG. 1 illustrates a compactor or a road roller (100) as an example of construction equipment comprising a flexible fuel filling cap (200) of a fuel tank according to an example of the present invention. Further, FIG. 2 illustrates an enlarged view of a flexible fuel filling cap (200) of a fuel tank according to an example of the present invention installed to the construction equipment according to FIG. 1.

[34] As illustrated in FIG. 1, a compactor or a road roller (100) comprises a vehicle body (110), a front drum, which is installed in the front of the vehicle body (110) and is used to compact the ground or an asphalt pavement, and a rear drum (130), which is installed in the rear of the vehicle body (110) and is used to compact the ground or an asphalt pavement.

[35] The vehicle body (110) is loaded with a cabin seat (111), on which a driver sits, an engine (113), which generates a travelling power, and an ROPS (Roll-Over Protective Structure) (115) to safely protect a driver sitting on the cabin seat (111) when a compactor or a road roller (100) rolls over.

[36] A vibrating means (not shown) is mounted inside at least one of the front drum (120) and the rear drum (130). When the front drum (120) or the rear drum (130) rotates, the vibrating means is eccentrically rotated within the front drum (120) or the rear drum (130) and generates a vibratory force to the ground or an asphalt pavement.

[37] A ballast (140) is installed in one side of at least one of the front drum (120) and the rear drum (130). The ballast applies a weight to the front drum (120) or the rear drum (130) to compact the ground or an asphalt pavement well. The ballast (140) is in the shape of a container, which can be filled with water, sand or metal scrap to increase weight.

[38] A drum cooling means (150) is installed in the bottom of the ballast (140). The drum cooling means (150) sprays cooling water on the surface of at least one of the front drum (120) and the rear drum (130) to cool the front drum (120) or the rear drum (130) and simultaneously remove asphalt particles from the surface of the front drum (120) or the rear drum (130).

[39] Further, the vehicle body (110) is loaded with a fuel tank (160), in which fuel used in driving an engine (113) is stored. As specifically illustrated in FIG. 2, the fuel tank

(160) is installed under the cabin seat (111) due to the restriction on installation space. Further, the top outer surface of the fuel tank (160) of the vehicle body (110) is covered with an outer cover (117), in which a cutout (117a) is formed so that fuel can be injected by a fuel supply pipe.

[40] A flexible fuel filling cap (200) of the fuel tank for opening and closing a fuel filling inlet according to an example of the present invention may be applied to the fuel tanks of all construction equipments. However, it is preferable that such a flexible fuel filling cap be applied to the construction equipment, like the compactor or the road roller (100) as illustrated in FIG. 1, wherein the fuel tank (160) is located inside the outer cover (117) without being exposed to the outside, and is accessible only through the cutout (117a) of the outer cover when fuel is supplied.

[41]

[42] FIG. 3 illustrates an exploded perspective view of the flexible fuel filling cap (200) of the fuel tank according to an example of the present invention. FIG. 4 illustrates a cross-sectional structure of the flexible fuel filling cap (200) of the fuel tank according to an example of the present invention.

[43] As illustrated in FIG. 3 and FIG. 4, the flexible fuel filling cap (200) of the fuel tank according to an example of the present invention comprises: a base plate (210), which is coupled to a top surface of the fuel tank (160) and comprises a support pipe (211) which is introduced into the fuel tank (160) in its center; a flexible pipe (220), wherein its bottom end is coupled to an inner wall of the support pipe (211) of the base plate (210), and the flexible pipe is formed of bellows longitudinally flexible by an outer force and comprises a flange (221) located in the top of the base plate (210) in its top end; and a cap member (230) detachably coupled to the base plate (210).

[44] Herein, the base plate (210) supports longitudinal flexibility of the flexible pipe (220) and opens and closes the fuel filling inlet by the detachable coupling of the cap member (130). When the length of the flexible pipe (220) is reduced, the flange (221) is seated and supported in a top surface of the base plate (210), and the bottom surface of the base plate (210) is sealingly welded or thermoset to the top surface of the fuel tank (160).

[45] Further, the support pipe (211) extends into the fuel tank (160) in the center of the base plate (210). The support pipe (211) is coupled to a bottom end of the flexible pipe (220) to fix the location of the bottom end of the flexible pipe (220) allowing the flexible pipe (220) to be longitudinally flexible. As illustrated in FIG. 3 and FIG. 4, it is preferable that the support pipe (211) extend perpendicularly downwards. However, the support pipe (211) may extend slantly downwards towards inside the vehicle body (110) so that the fuel supply pipe can be easily inserted from the lateral top when fuel is supplied.

[46]

[47] The above-mentioned base plate (210) comprises the flexible pipe (220), which can be withdrawn to the outside. The flexible pipe (220) is pulled by an outer force, i.e., the operator's force, and its length is extended so that the support pipe (211) of the base plate (210) may be withdrawn to the outside. As a result, accessibility to the fuel supply pipe is enhanced when fuel is supplied. Further, the flexible pipe (220) is compressed by outer force, and its length is reduced, thereby the base plate (210) and the cap member (130) can be coupled.

[48] The bottom end of the flexible pipe (220) is coupled to the inner wall of the support pipe (211) of the base plate (210) in various ways, such as bonding, thermosetting, etc.

[49] Further, the top end of the flexible pipe (220) is equipped with the flange (221). The flange (221) of the flexible pipe (220) is seated in the top end of the base plate (210) and supported when the length of the flexible pipe (220) is reduced, and thus, functions as a kind of stopper not to be entered into the inside of the support pipe (211) of the base plate (210).

[50] The flange (221) of the flexible pipe (220) has a width less than the base plate (210) not to be protruded to the outer surface of the base plate (210). Due to this, the cap member (230) can be detachably coupled to the outer surface of the flexible pipe (220).

[51] Further, it is preferable that the flange (221) of the flexible pipe (220) be separately equipped with a holding member (223). The holding member (223) functions as holding the flange (221) seated in the base plate (210) to easily pull it. As illustrated in FIG. 3, the holding member (223) may be formed in the shape of a ring that can be put on the operator's finger, but any shape or form that can be protruded to the outside of the flange (221) of the flexible pipe (220) is allowable. Further, although the holding member (223) is protruded to the outside of the flange (221) of the flexible pipe (220), it has a length that is not protruded to the outside of the base plate (210) in order not to disrupt the coupling of the cap member (230) to the base plate (210).

[52] As a nozzle of the fuel supply pipe is inserted into the flexible pipe (220), which was withdrawn to the outside of the support pipe (211) of the base plate (210) when fuel is supplied, the flexible pipe (220) forms a fuel filling inlet and a fuel inlet piping so that fuel can be injected to the inside of the fuel tank (160). Accordingly, it is preferable that the flexible pipe (220) be manufactured with rubber materials or chemically resistant resin materials such that material characteristic can be maintained even if it is in contact with fuel.

[53]

[54] The cap member (230) actually opens or closes the fuel filling inlet of the fuel tank (160), and is detachably coupled to the above-mentioned base plate (210). It is preferable that the cap member (230), as illustrated in FIG. 4, be screw-coupled to the

outer surface of the base plate (210). To this end, a screw thread is equipped on the outer surface of the base plate (210), and a screw thread corresponding to the screw thread of the base plate (210) is formed on the bottom of the inner circumference surface of the cap member (230). In addition to the screw-coupling as mentioned above in connection with detachable coupling of the cap member (230) to the base plate (210), all coupling methods that are detachable may be applied.

[55] The cap member (230) is not completely separated from the base plate (210), but it is preferable that the cap member be connected to the base plate (210) by the connection member (231) to prevent loss. Such a connection member, as illustrated in FIG. 3, comprises a strip member (231a), one end of which is connected to the lateral bottom end of the base plate (210), and a ring member (231b), which is integrated with the other end of the strip member (231a) and to which the cap member (230) is rotatably coupled.

[56]

[57] The flexible fuel filling cap (200) of the fuel tank, for opening and closing a fuel filling inlet of the fuel tank (160), according to an example of the present invention may be applied to fuel tanks of all construction equipments. However, it is particularly preferable that the flexible fuel filling cap be applied to the construction equipment, wherein the fuel tank (160) is located inside the outer cover (117) without being exposed to the outside of the vehicle body (110) and is configured to be accessible only though the cutout (117a) of the outer cover (117) when fuel is supplied, such as the compactor or the road roller (100) as illustrated in FIG. 1.

[58]

[59] FIG. 5 illustrates a state of the use of the flexible fuel filling cap (200) of the fuel tank when filling it with fuel according to an example of the present invention. FIG. 6 illustrates a cross-sectional structure of the flexible fuel filling cap (200) of the fuel tank when filling it with fuel according to an example of the present invention.

[60] Referring to FIG. 5 and FIG. 6, a method of using the flexible fuel filling cap (200) of the fuel tank when filling it with fuel according to an example of the present invention is explained in detail below.

[61] When fuel is supplied by the fuel supply pipe (not shown), first, the operator puts his or her hand through the cutout (117a) of the outer cover (117), and then, rotates the cap member (230) to the unlock direction to separate the cap member (230) from the base plate (210). Thereafter, the holding member (223) formed in the flange of the flexible pipe (220) seated on the base plate (210) is pulled to the outside to be withdrawn to the outside of the cutout (117a) of the outer cover (117). After inserting the nozzle (not shown) of the fuel supply pipe into the flexible pipe (220), fuel is supplied. As the length of the flexible pipe (220) is extended, the flexible pipe gets out of the support

pipe (211) of the base plate (210).

[62] In such case, it would be difficult for the operator to hold even the holding member (223) of the flexible pipe (220) in addition to the fuel supply pipe. Thus, it is preferable to allow the flange (221) of the flexible pipe (220) withdrawn to the outside of the cutout (117a) of the outer cover (117) to be held in a specific portion of the outer cover (117). To this end, a flange support member (119), which the flange of the flexible pipe (220) is detachably coupled to, is equipped on the outer surface of the outer cover (117) adjacent to the cutout (117a).

[63] It is preferable that the flange support member (119) be formed in the shape of a hook, specifically, a hook constituted to be rotatable in a range of 90 degrees, and that the flange (221) of the flexible pipe (230). It is preferable that the flange (221) of the flexible pipe (220) latch on the hook-shaped flange support member (119). As illustrated in FIG. 5 and FIG. 6, a ring-shaped holding member (223) may latch on the hook-shaped flange support member (119). If the holding member (223) is not in a ring shape, a latching portion on which the hook-shaped flange support member (119) latches may be separately formed in the flange (221) of the flexible pipe (220).

[64] When completing the fuel supply, the flange (221) of the flexible pipe (220) is separated from the flange support member (119), and then, is pushed into and seated to the base plate (210) through the cutout (117a) of the outer cover (117). As the length of the flexible pipe (220) is reduced, the flexible pipe is entered into the support pipe (211) of the base plate (210). Thereafter, the cap member (230) is rotated in the lock direction to be coupled to the base plate (210).

[65] The flexible fuel filling cap (200) of the fuel tank according to an example of the present invention comprises a flexible pipe (220) that can be withdrawn to the outside. Thus, if the flexible fuel filling cap is applied to the construction equipment, wherein the fuel tank (160) is located inside the outer cover (117) without being exposed to the outside of the vehicle body (110), and is configured to be accessible only thorough the cutout (117a) of the outer cover (117) when fuel is supplied, accessibility to the fuel supply pipe when fuel is supplied can be considerably improved without lowering space efficiency associated with the installation of the fuel tank (160).

[66]

[67] Although the invention has been described with reference to the preferred embodiments in the attached figures, it is noted that equivalents may be employed and substitutions made herein without departing from the scope of the invention as recited in the claims.

Industrial Applicability

[68] The present invention is applicable to a fuel tank of construction equipment

comprising compactors and road rollers.

Claims

[Claim 1] A fuel filling cap, mounted in a fuel tank of construction equipment, for opening and closing a fuel filling inlet, comprising:
a base plate, which is coupled to a top surface of the fuel tank and comprises a support pipe introduced into the fuel tank in its center;
a flexible pipe, wherein its bottom end is coupled to an inner wall of the support pipe of the base plate, and the flexible pipe is formed of bellows longitudinally flexible by an outer force and comprises a flange located in the top of the base plate in its top end; and
a cap member detachably coupled to the base plate.

[Claim 2] The flexible fuel filling cap of the fuel tank as claimed in Claim 1, wherein the base plate is welded to the top surface of the fuel tank; the support pipe extends perpendicularly downwards or slantly downwards.

[Claim 3] The flexible fuel filling cap of the fuel tank as claimed in Claim 1, wherein the flange of the flexible pipe has a width less than the base plate.

[Claim 4] The flexible fuel filling cap of the fuel tank as claimed in Claim 1, wherein the flange of the flexible pipe is equipped with a holding member to enable an operator to easily hold.

[Claim 5] The flexible fuel filling cap of the fuel tank as claimed in Claim 1, wherein the flexible pipe is manufactured with rubber materials or chemically resistant resin materials.

[Claim 6] The flexible filling cap of the fuel tank as claimed in Claim 1, wherein the cap member is screw-coupled to the base plate.

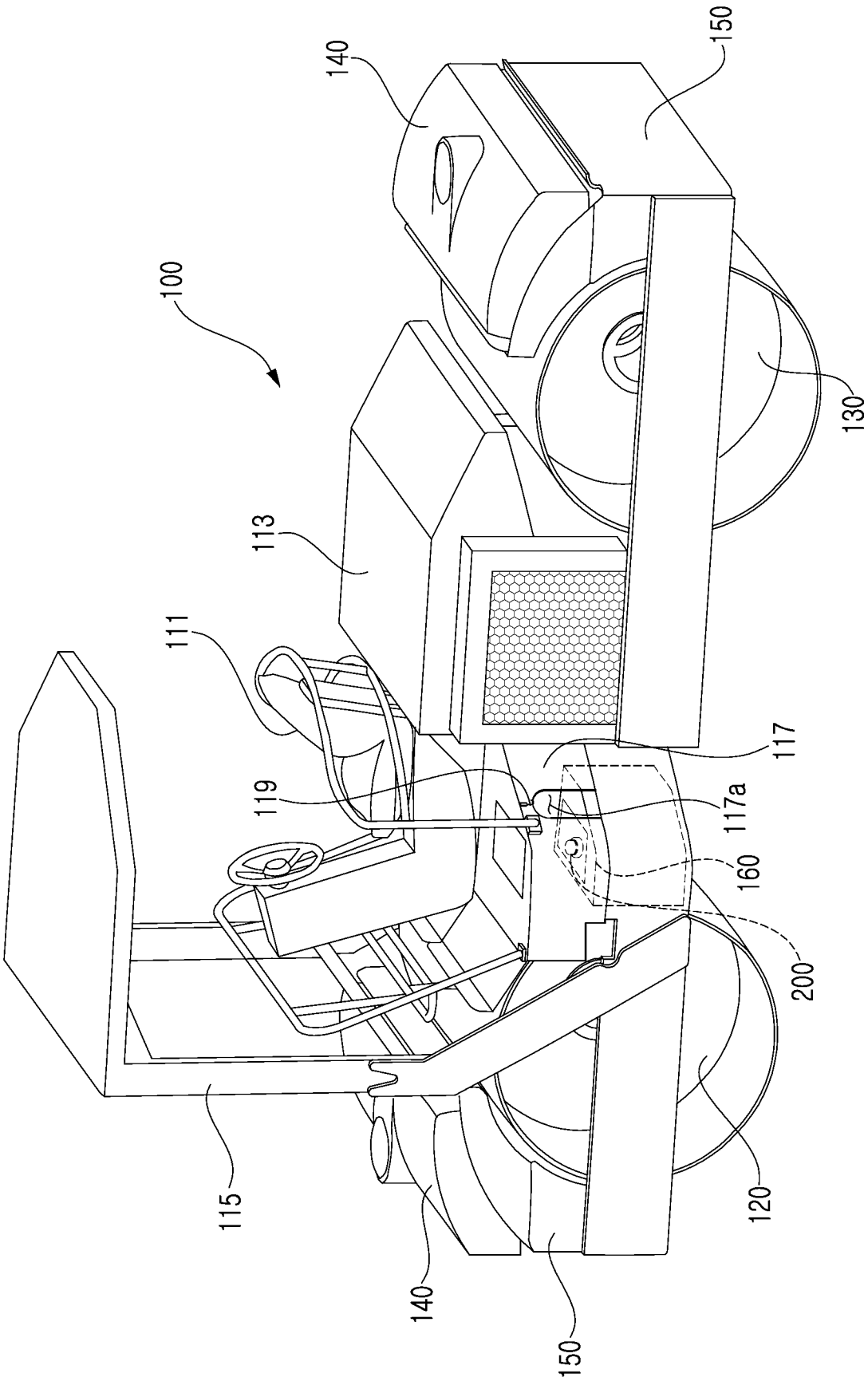
[Claim 7] The flexible fuel filling cap of the fuel tank as claimed in Claim 6, wherein the cap member is connected to the base plate by a connection member, which comprises a strip member connected to the base plate and a ring member integrated with the strip member and to which the cap member is rotatably coupled.

[Claim 8] The flexible fuel filling cap of the fuel tank as claimed in any one of Claims 1 to 7,
wherein the fuel tank is installed under the cabin seat in the construction equipment; the top outer surface of the fuel tank of the vehicle body in the construction equipment is covered with an outer cover in which a cutout is formed; and when fuel is supplied by the fuel supply pipe, the flange of the flexible pipe is withdrawn to the outside through the cutout of the outer cover.

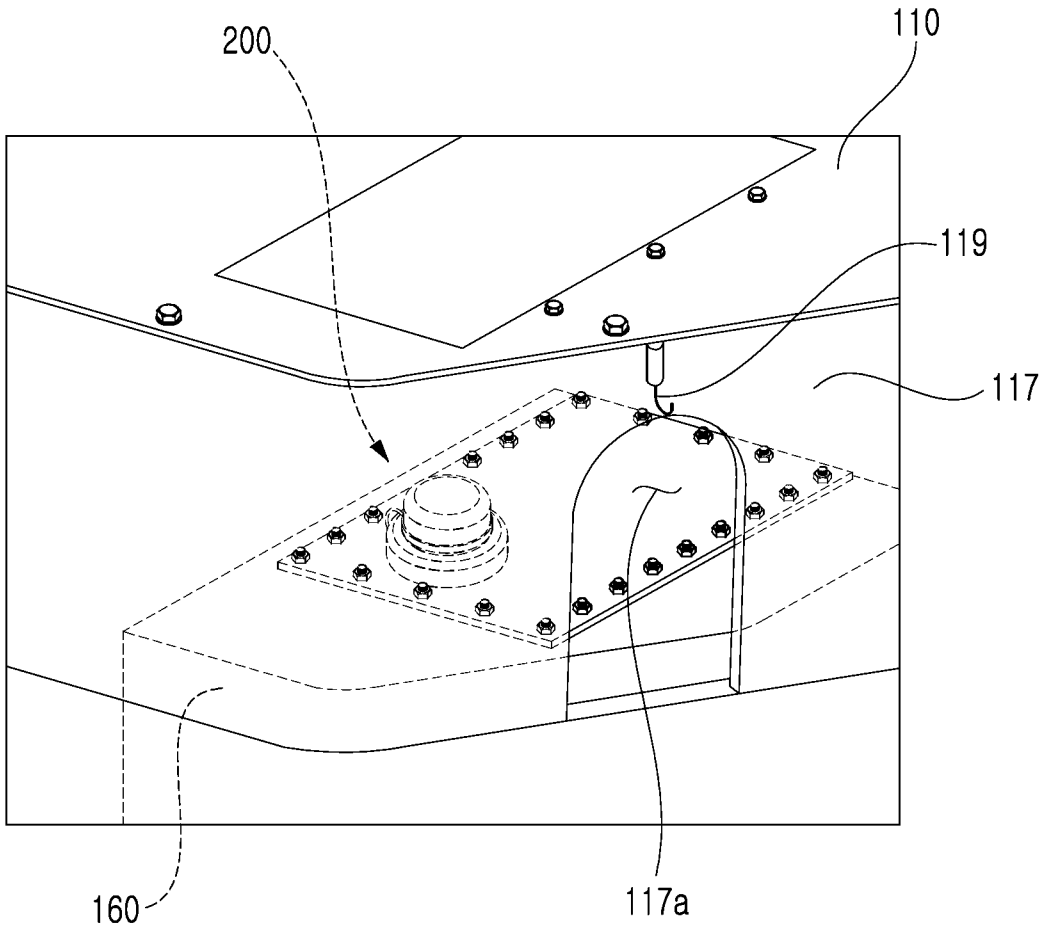
[Claim 9] The flexible fuel filling cap of the fuel tank as claimed in Claim 8, comprising a flange support member to which the flange of the flexible pipe is detachably coupled in the outer surface of the outer cover.

[Claim 10] The flexible fuel filling cap of the fuel tank as claimed in Claim 1, wherein the construction equipment is a compactor or a road roller.

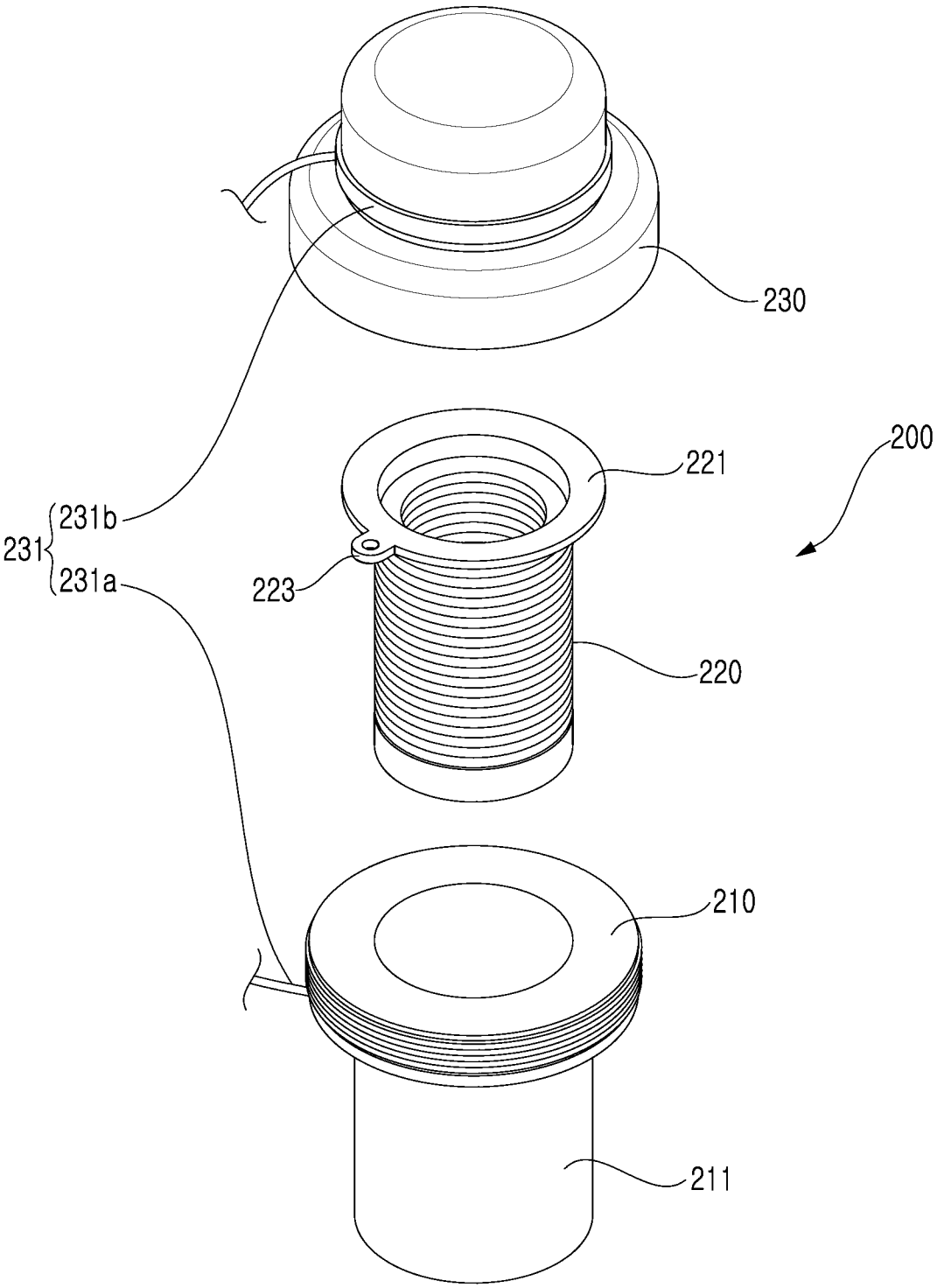
[Fig. 1]



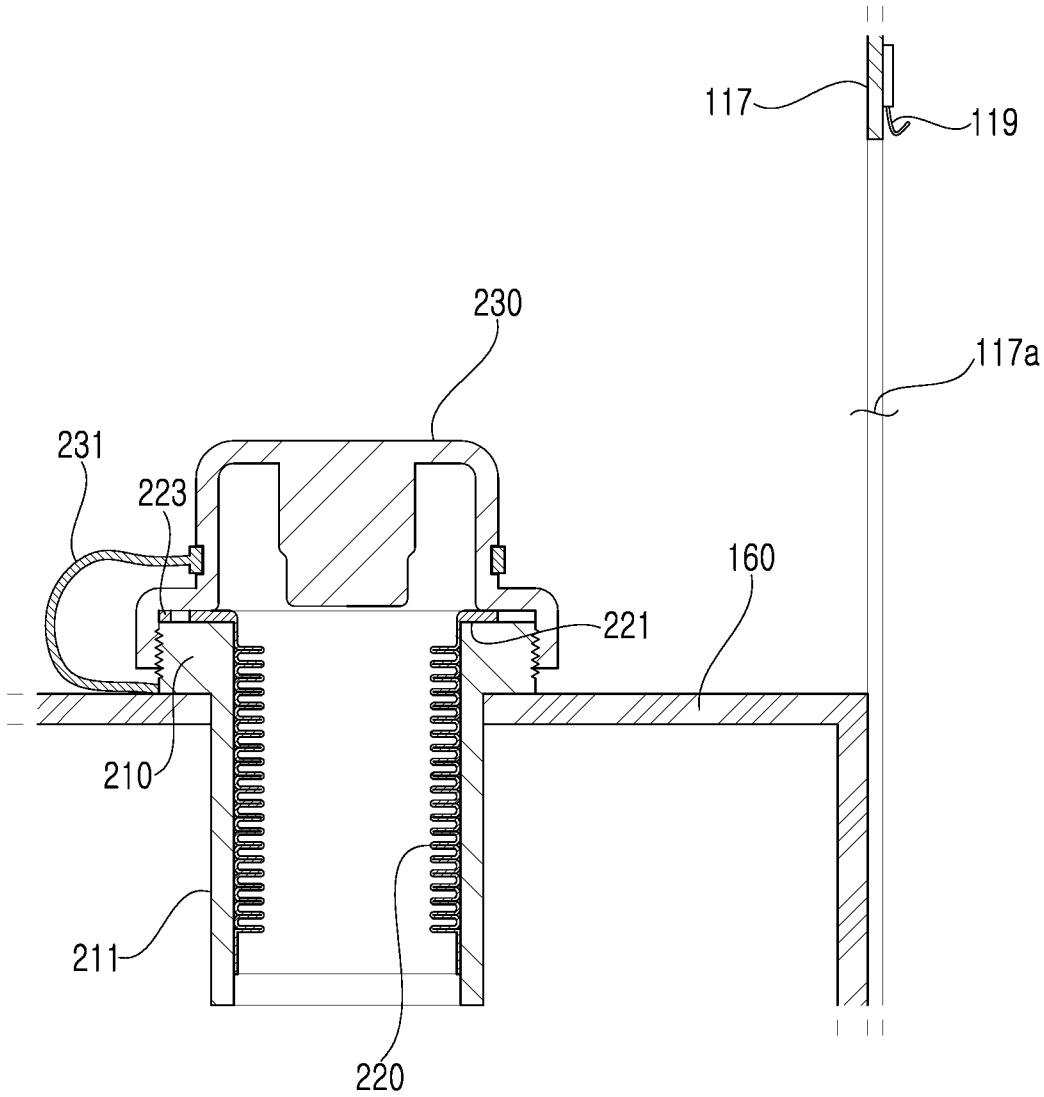
[Fig. 2]



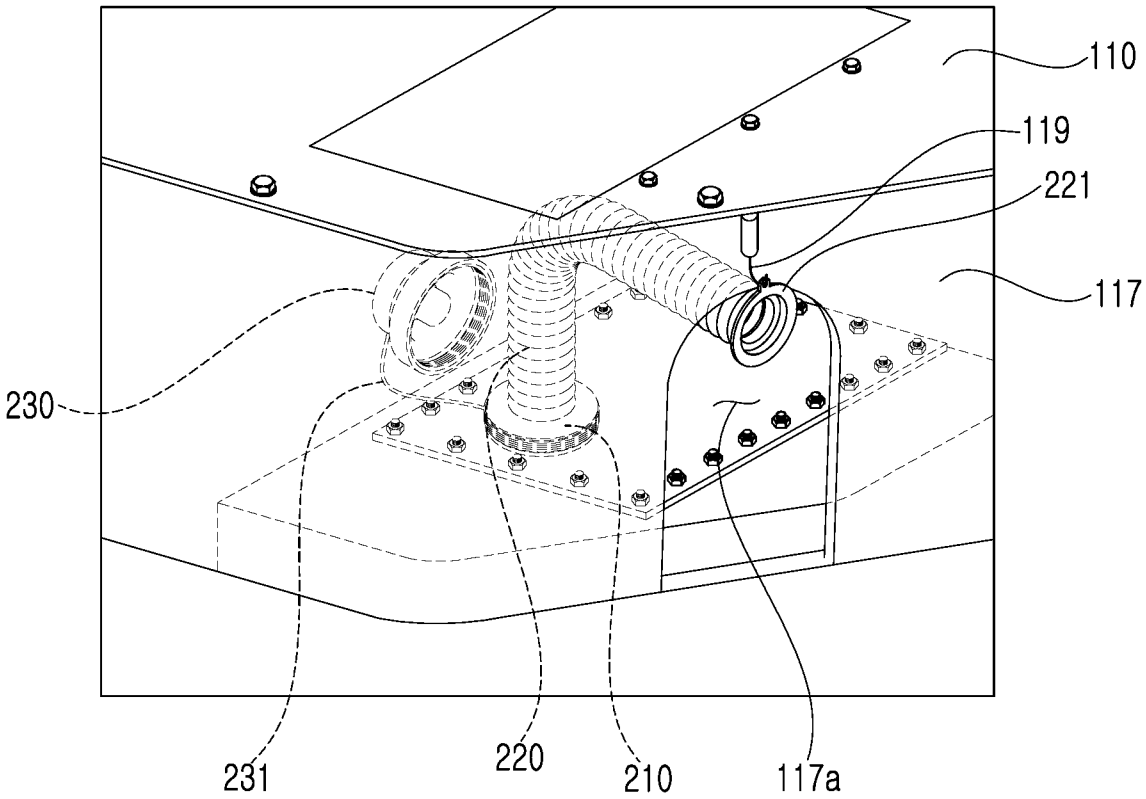
[Fig. 3]



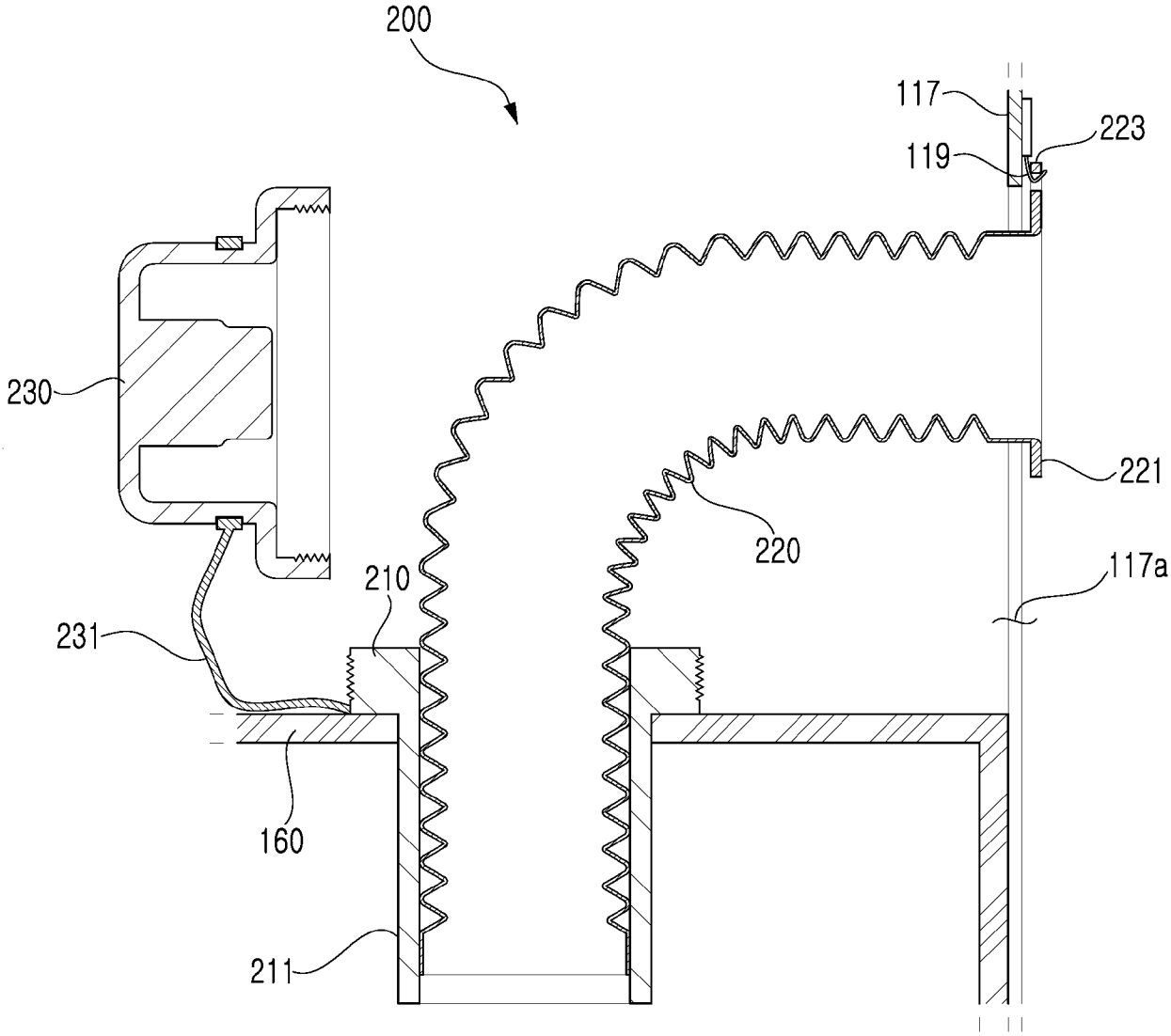
[Fig. 4]



[Fig. 5]



[Fig. 6]



PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference VCESE-57-PCT	**FOR FURTHER ACTION**	see Form PCT/ISA/220 as well as, where applicable, item 5 below.
International application No. **PCT/KR2014/007934**	International filing date *(day/month/year)* **26 August 2014 (26.08.2014)**	(Earliest) Priority Date *(day/month/year)*

Applicant

VOLVO CONSTRUCTION EQUIPMENT AB et al

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of **3** sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**
   a. With regard to the **language**, the international search was carried out on the basis of :
      ☒ the international application in the language in which it was filed
      ☐ a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))
   b. ☐ This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6*bis*(a)).
   c. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.
2. ☐ **Certain claims were found unsearchable** (See Box No. II)
3. ☐ **Unity of invention is lacking** (See Box No. III)
4. With regard to the **title,**
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established by this Authority to read as follows:
5. With regard to the **abstract,**
   ☒ the text is approved as submitted by the applicant.
   ☐ the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.
6. With regard to the drawings,
   a. the figure of the **drawings** to be published with the abstract is Figure No. **6**
      ☒ as suggested by the applicant.
      ☐ as selected by this Authority, because the applicant failed to suggest a figure.
      ☐ as selected by this Authority, because this figure better characterizes the invention.
   b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2014/007934

A. CLASSIFICATION OF SUBJECT MATTER

B60K 15/03(2006.01)i, B60K 15/04(2006.01)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)
B60K 15/03; B65D 51/24; B60K 15/04; B62D 25/10; B65D 25/44; B65D 47/06; B65D 51/20

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: fuel filling cap, tank, flexible pipe, bellows, flange, cap, collapsible and extendible

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	WO 96-33103 A2 (ARTFORM INTERNATIONAL LTD.) 24 October 1996 See abstract, page 3, claims 1, 4, 5 and figure 3.	1-10
Y	US 5823372 A (LEVINE, ALAN) 20 October 1998 See abstract, column 4, lines 45-51, claims 1, 5, 17 and figures 1-3.	1-10
Y	JP 2007-090953 A (ISHIKAWAJIMA CONSTR MACH CO., LTD.) 12 April 2007 See abstract, paragraphs [0012], [0017], [0033] and figures 3, 5.	8-10
A	JP 09-290848 A (NAGASHIO KICHINOSUKE) 11 November 1997 See abstract, paragraphs [0010], [0012] and figures 1-3.	1-10
A	US 4560081 A (ADAMS, JAY J.) 24 December 1985 See abastact, column 2, line 46 - column 3, line 18 and figures 2, 4, 5.	1-10

☐ 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)
"O" document referring to an oral disclosure, use, exhibition or other means
"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
22 May 2015 (22.05.2015)	**22 May 2015 (22.05.2015)**

Name and mailing address of the ISA/KR
International Application Division
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea
Facsimile No. +82-42-472-7140

Authorized officer
LEE, Hun Gil
Telephone No. +82-42-481-8525

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/KR2014/007934

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 96-33103 A2	24/10/1996	AU 1996-41796 A GB 9508044 D0 WO 96-33103 A3	07/11/1996 07/06/1995 03/01/1997
US 5823372 A	20/10/1998	None	
JP 2007-090953 A	12/04/2007	None	
JP 09-290848 A	11/11/1997	None	
US 4560081 A	24/12/1985	CA 1235388 A1	19/04/1988