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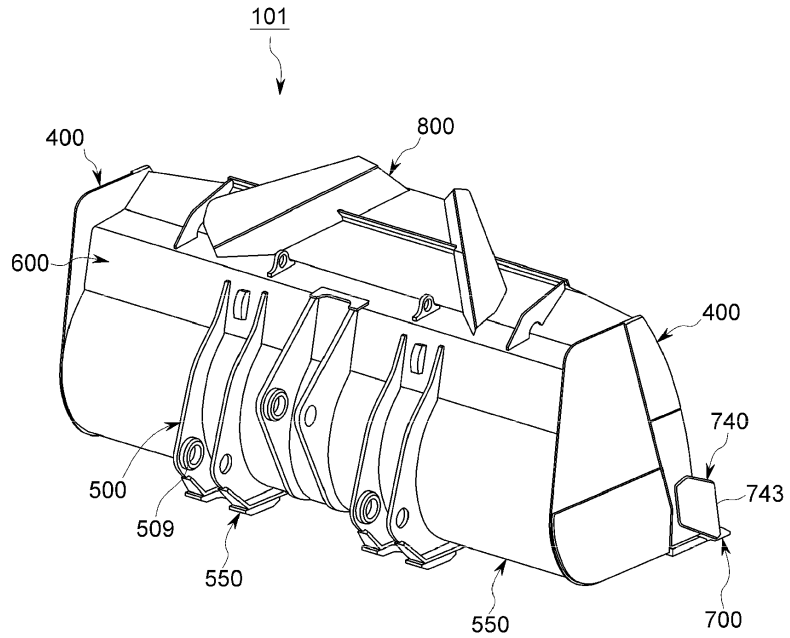
## (54) BUCKET

(57) The present disclosure relates to a bucket installed at a construction machine, the bucket including a back plate including a first planar portion relatively adjacent to an excavation target, a second planar portion disposed such that an intersection angle with respect to the first planar portion becomes a first set angle, a curved portion connecting one end portion of the first planar portion and one end portion of the second planar portion, and a third planar portion bent from another end portion of the second planar portion to extend therefrom and disposed such that an intersection angle with respect to the first planar portion becomes a second set angle that is less than the first set angle; and side plates respectively formed on opposite sides of the back plate so as to define a loading space, together with the back plate.

Fig. 1

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## Description

[TECHNICAL FIELD]

**[0001]** Embodiments of the present disclosure relates to a bucket, and more particularly, to a bucket installed at a construction machine.

[BACKGROUND ART]

**[0002]** In general, a bucket is installed and used at a construction machine such as an excavator or a wheel loader. For example, an excavator is a construction machine used to mine soil or rocks. An arm is provided at a front portion of a body of the excavator, and a bucket is installed at an end portion of the arm to mine soil or rocks and store them temporarily. The arm is rotatably installed via a link member and a hydraulic device. The bucket for mining soil and rocks and temporarily storing them is also rotatably installed at the end portion of the arm. In addition, one or more teeth are installed at an end portion of the bucket that firstly contacts an excavation target, for example, soil or rock, thereby improving excavation performance. Further, a wheel loader is a construction machine that collects and transports aggregates or loads them on a transport vehicle. At an end portion of an arm which is provided at a front portion of the wheel loader, a bucket for loading and transporting aggregates is installed.

**[0003]** As such, the bucket installed at the construction machine serves to excavate the ground, collect soil and gravel, or load and transport loads such as aggregates.

**[0004]** In the process of the construction machine conducting tasks of digging the ground or collecting and loading aggregates, however, a reaction force is generated in the ground when the bucket penetrates the ground. Accordingly, it is advantageous that the bucket is manufactured in a shape capable of minimizing the influence of reaction force when penetrating the ground. In addition, the larger the loading capacity of the bucket, the greater the working capacity per hour, so if the conditions are the same, it is advantageous to have a large loading capacity.

**[0005]** However, the reaction force that is generated when the bucket penetrates the ground and the loading capacity of the bucket are generally in a trade-off relationship. That is, it is a common phenomenon that increasing the loading capacity of the bucket leads to an increase in a reaction force that is generated when the bucket penetrates the ground. Accordingly, there is a need for a shape of the bucket for minimizing the reaction force when the bucket penetrates the ground, while ensuring the maximum loading capacity of the bucket.

[DESCRIPTION OF INVENTION]

[TECHNICAL OBJECTIVES]

**[0006]** Embodiments of the present disclosure provides a bucket that minimizes a reaction force when the bucket penetrates the ground, while improving loading capacity.

[TECHNICAL SOLUTION TO THE PROBLEM]

**[0007]** According to an embodiment of the present disclosure, a bucket 101 installed at a construction machine includes a back plate 200 including a first planar portion 210 relatively adjacent to an excavation target, a second planar portion 220 disposed such that an intersection angle $\theta 1$ with respect to the first planar portion 210 becomes a first set angle, a curved portion 250 connecting one end portion of the first planar portion 210 and one end portion of the second planar portion 220, and a third planar portion 230 bent from another end portion of the second planar portion 220 to extend therefrom and disposed such that an intersection angle $\theta 2$ with respect to the first planar portion 210 becomes a second set angle that is less than the first set angle; and side plates 400 respectively formed on opposite sides of the back plate 200 so as to define a loading space, together with the back plate 200.

**[0008]** In some embodiments, the second set angle may be lower than the first set angle.

**[0009]** In some embodiments, the side plate 400 may include a first side 401 relatively adjacent to the first planar portion 210 of the back plate 200 and parallel to the first planar portion 210; a second side 402 relatively adjacent to the second planar portion 220 and the third planar portion 230 of the back plate 200 and parallel to the first side 401; a third side 403 connecting one end portion of the first side 401 relatively adjacent to another end portion of the first planar portion 210 of the back plate 200, and one end portion of the second side 402 relatively adjacent to the third planar portion 230 of the back plate 200; and a fourth side 404 connecting another end portion of the first side 401 and another end portion of the second side 402.

**[0010]** In some embodiments, a length between one end portion and another end portion of the first planar portion 210 of the back plate 200 may be longer than a length between one end portion and another end portion of the second

planar portion 220 and shorter than the fourth side 404 of the side plate 400.

**[0011]** In some embodiments, the third side 403 may be a line convexly curved in a direction opposite to a direction of the curved portion 250 of the back plate 200.

**[0012]** In some embodiments, an intersection angle between the second side 402 and the fourth side 404 may be greater than the first set angle by 20 degrees or more.

**[0013]** In some embodiments, the bucket 101 may further include a side cutter 740 coupled to one end portion of the fourth side 404 of the side plate 400 that is relatively adjacent to the first planar portion 210. A blade 743 may be formed at the side cutter 740 in a direction parallel to the side plate 400.

**[0014]** In some embodiments, the bucket 101 may further include a horizontal support coupled to an outer surface of the second planar portion 220 of the back plate 200, the horizontal support having a length in a horizontal direction.

**[0015]** In some embodiments, the bucket 101 may further include a spill prevention plate 800 coupled to the third planar portion 230 of the back plate 200, the spill prevention plate 800 protruding from an end portion of the third planar portion 230 in a direction opposite to a direction of the second planar portion 220.

**[0016]** In some embodiments, the bucket 101 may further include a vertical support frame 500 coupled to outer surfaces of the curved portion 250 and the second planar portion 220 of the back plate 200, having a length in a vertical direction, and defined with a coupling hole 509 so as to be installed at the construction machine; and a bottom plate 550 coupled to the vertical support frame 500 so as to protrude by a predetermined thickness in a direction perpendicular to an outer surface of the first planar portion 210 of the back plate 200.

**[0017]** In some embodiments, the bucket 101 may further include a plurality of teeth 700 coupled to another end portion of the first planar portion 210 of the back plate 200.

[EFFECTS OF THE INVENTION]

**[0018]** According to embodiments of the present disclosure, a bucket may minimize a reaction force when the bucket penetrates the ground, while improving loading capacity.

[BRIEF DESCRIPTION OF DRAWINGS]

**[0019]**

FIG. 1 is a perspective view illustrating a bucket according to an embodiment of the present disclosure.
FIG. 2 is a side view illustrating the bucket of FIG. 1.

[DETAILED DESCRIPTION]

**[0020]** Hereinafter, embodiments of the present disclosure will be described in detail with reference to the accompanying drawings so that those skilled in the art to which the present inventive concept pertains may readily understand and practice the inventive concept. The present disclosure may be implemented in many different forms and is not limited to the embodiments described herein.

**[0021]** Note that the drawings are schematic and not to scale. The relative dimensions and proportions of the parts in the drawings are illustrated exaggerated or reduced in size for clarity and convenience, and any dimensions are merely illustrative and not limiting. Like reference numerals are used to indicate similar features in the same structures, elements, or parts appearing in two or more drawings.

**[0022]** Embodiments of the present disclosure specifically illustrate representative embodiments of the present disclosure. Accordingly, various modifications based on the illustration are expected. Therefore, embodiments are not limited to a specific form of the illustrated area, and includes, for example, modifications of the form by manufacturing.

**[0023]** Hereinafter, a bucket 101 according to an embodiment of the present disclosure will be described with reference to FIGS. 1 and 2.

**[0024]** The bucket 101 according to an embodiment of the present disclosure may be installed at a construction machine and used to excavate soil or rocks of the ground or collect aggregates and to load and move them. As an example, the bucket 101 may be installed at an excavator or a wheel loader, which is a kind of construction machine.

**[0025]** As illustrated in FIGS. 1 and 2, the bucket 101 according to an embodiment of the present disclosure includes a back plate 200 and a side plate 400.

**[0026]** In addition, the bucket 101 according to an embodiment of the present disclosure may further include a side cutter 740, a horizontal support 600, a spill prevention plate 800, a vertical support frame 500, a bottom plate 550, and a plurality of teeth 700.

**[0027]** The back plate 200 defines a loading space, together with the side plate 400 to be described below. Specifically, the back plate 200 includes a first planar portion 210 relatively adjacent to an excavation target, a second planar portion

220 disposed such that an intersection angle θ1 with respect to the first planar portion 210 becomes a first set angle, a curved portion 250 connecting one end portion of the first planar portion 210 and one end portion of the second planar portion 220, and a third planar portion 230 bent from another end portion of the second planar portion 220 to extend therefrom and disposed such that an intersection angle θ2 with respect to the first planar portion 210 becomes a second set angle that is less than the first set angle.

**[0028]** A radius of curvature RC1 of the curved portion 250 of the back plate 200 may be in a range of 400 mm to 500 mm.

**[0029]** In some embodiments, the second set angle may be set to an angle lower than the first set angle. As an example, in a case where the first set angle is in a range of 40 degrees to 50 degrees, the second set angle may be in a range of 30 degrees to 40 degrees.

**[0030]** In some embodiments, a length L between one end portion and another end portion of the first planar portion 210 of the back plate 200 may be longer than a length between one end portion and another end portion of the second planar portion 220 and shorter than a fourth side 404 of the side plate 400. In such an embodiment, one end portion of the first planar portion 210 may be connected to the curved portion 250 and the plurality of teeth 700 to be described below may be installed at another end portion of the first planar portion 210.

**[0031]** In some embodiments, the back plate 200 is formed of a material having excellent abrasion resistance since it directly contacts an excavation target such as soil.

**[0032]** The side plates 400 are formed on opposite sides of the back plate 200, respectively, to form a loading space, together with the back plate 200. Specifically, the side plate 400 includes a first side 401 relatively adjacent to the first planar portion 210 of the back plate 200 and parallel to the first planar portion 210; a second side 402 relatively adjacent to the second planar portion 220 and the third planar portion 230 of the back plate 200 and parallel to the first side 401; a third side 403 connecting one end portion of the first side 401 relatively adjacent to another end portion of the first planar portion 210 of the back plate 200, and one end portion of the second side 402 relatively adjacent to the third planar portion 230 of the back plate 200; and a fourth side 404 connecting another end portion of the first side 401 and another end portion of the second side 402. In such an embodiment, the third side 403 may be formed as a line convexly curved in a direction opposite to a direction of the curved portion 250 of the back plate 200. A radius of curvature RC2 of the third side 403 may be in a range of 1800 mm to 2200 mm.

**[0033]** In some embodiments, an intersection angle between the second side 402 and the fourth side 404 of the side plate 400 may be formed to be greater than the first set angle by 20 degrees or more. In some embodiments, the side plate 400 is formed to have a vertical height, with respect to the first planar portion 210 of the back plate 200, at least higher than the second planar portion 220. Accordingly, a corner area where the first side 401 and the fourth side 404 meet each other covers not only a side surface of the horizontal support 600 to be described below, but also a portion of the vertical support frame 500 and a portion of the spill prevention plate 800. This not only is advantageous in terms of aesthetics, but also prevents a weight of the bucket 101 from being unnecessarily increased when soil flows into an empty space of the horizontal support 600, to be described below, and fills the empty space.

**[0034]** The plurality of teeth 700 may be coupled to another end portion of the first planar portion 210 of the back plate 200. The plurality of teeth 700 are installed so as to contact, firstly, an excavation target such as soil or rock so as to improve excavation performance.

**[0035]** The side cutter 740 is coupled to one end portion of the fourth side 403 of the side plate 400 that is relatively adjacent to the first planar portion 210. A blade 743 is formed at the side cutter 740, in a direction parallel to the side plate 400. The side cutter 740 cuts an excavation target in a direction parallel to the side plate 400, thereby further improving excavation performance.

**[0036]** The horizontal support 600 is coupled to an outer surface of the second planar portion 220 of the back plate 200 and has a length in a horizontal direction. The horizontal support 600 reinforces strength of the back plate 200. In specific, the horizontal support 600 may be bent forming a hollow triangular cross-section. Accordingly, the strength of the back plate 20 may be effectively reinforced while minimizing an overall weight increase of the bucket 101.

**[0037]** The vertical support frame 500 is coupled to outer surfaces of the curved portion 250 and the second planar portion 220 of the back plate 200 and has a length in a vertical direction. The vertical support frame 500 also reinforces the strength of the back plate 200. In addition, a coupling hole 509 may be defined at the vertical support frame 500 such that the vertical support frame 500 may be installed at the construction machine.

**[0038]** In some embodiments, the vertical support frame 500 may be provided with a plurality of vertical support frames 500, and the coupling holes 509 respectively defined at the plurality of vertical support frames 500 are mechanically connected to the construction machine, such that the bucket 101 is operated by a driving device of the construction machine.

**[0039]** The bottom plate 550 is coupled to the vertical support frame 500 so as to protrude by a predetermined thickness in a direction perpendicular to an outer surface of the first planar portion 210 of the back plate 200. The bottom plate 550 suppresses wear of the vertical support frame 500 and the back plate 200. The bottom plate 550 is replaceable, and may increase an overall wear life of the bucket 101.

**[0040]** The spill prevention plate 800 is coupled to the third planar portion 230 of the back plate 200 and protrudes

from an end portion of the third planar portion 230 in a direction opposite to the second planar portion 220. The spill prevention plate 800 prevents a load loaded on the bucket 101 from being spilt. In particular, the spill prevention plate 800 prevents the load, soil, from being spilt toward a portion where the bucket 101 and the construction machine are mechanically connected to each other and toward a driving cylinder for driving the bucket 101.

**[0041]** With such a configuration, the bucket 101 according to an embodiment of the present disclosure may enhance loading capacity, while minimizing a reaction force when excavating the ground.

**[0042]** Hereinafter, Experimental Example according to an embodiment of the present disclosure and Comparative Example will be compared, with reference to Table 1 and Table 2.

[Table 1]

| Component | Experimental Example | Comparative Example |
|---|---|---|
| Length of First planar portion of Back plate | 900 mm | 775 mm |
| First set angle | 45 | 45 |
| Second set angle | 35 | 30 |
| Radius of curvature of Curved portion of Back plate | 430 mm | 460 mm |
| Radius of curvature of Third side of Side plate | 2000 mm | 0 |

**[0043]** In Table 1, the length of the first planar portion of the back plate means a length between one end portion and another end portion of the first planar portion 210 of the back plate 200 illustrated in FIG. 2. Herein, one end portion of the first planar portion 210 may be connected to the curved portion 250, and the plurality of teeth 700 to be described below may be installed at another end portion of the first planar portion 210.

**[0044]** In addition, in Table 1, the first set angle means the intersection angle $\theta 1$ between the first planar portion 210 and the second planar portion 220 of the back plate 200 illustrated in FIG. 2. The second set angle means the intersection angle $\theta 2$ between the first planar portion 210 and the third planar portion 230 of the back plate 200 illustrated in FIG. 2.

**[0045]** In Table 1, the radius of curvature of the curved portion of the back plate is reference numeral RC1 in FIG. 2, and the radius of curvature of the third side of the side plate is reference numeral RC2 in FIG. 2.

**[0046]** In addition, in Experimental Example and Comparative Example, the experiments were conducted in a state that only numerical values of the components are different, as illustrated in Table 1, while other conditions are the same.

**[0047]** The following Table 2 shows the results according to the experiments. That is, loading weight and penetration reaction force of each of Experimental Example according to an embodiment of the present disclosure and Comparative Example to compare with Experimental Example were identified as in Table 2 below through the experiment.

[Table 2]

| Classification | Maximum loading weight [kg] | Penetration reaction force [kgf] |
|---|---|---|
| Comparative Example | 6, 900 | 95,000 |
| Experimental Example | 7,400 | 90,000 |
| Change rate | + 7.2 % | - 5.3 % |

**[0048]** As shown in Table 2 above, it was appreciated that the loading weight was increased by 7.6 % and the penetration reaction force was decreased by 5.2 % in Experimental Example, as compared to Comparative Example.

**[0049]** Although embodiments of the present disclosure have been described with reference to the accompanying drawings, those skilled in the art to which the present inventive concept pertains may understand that the present disclosure may be implemented in other specific forms without changing its technical spirit or essential features.

**[0050]** Therefore, it should be construed that embodiments described above are illustrative in all respects and are non-limiting, that the scope of the present disclosure is represented by the following claims, and that the meaning and scope of the claims and any altered or modified form derived from the equivalent concept are included in the scope of the present disclosure.

[Reference Numerals]

**[0051]**

| | | | |
|---|---|---|---|
| 101: | Bucket | 200: | Back plate |
| 210: | First planar portion | 220: | Second planar portion |
| 230: | Third planar portion | 250: | Curved portion |
| 400: | Side plate | 401: | First side |
| 402: | Second side | 403: | Third side |
| 404: | Fourth side | 500: | Vertical support frame |
| 509: | Coupling hole | 550: | Bottom plate 550 |
| 600: | Horizontal support | 700: | Teeth |
| 740: | Side cutter | 800: | Spill prevention plate |

## Claims

1. A bucket (101) installed at a construction machine, the bucket 101 comprising:

   a back plate (200) comprising a first planar portion (210) relatively adjacent to an excavation target, a second planar portion (220) disposed such that an intersection angle ($\theta 1$) with respect to the first planar portion (210) becomes a first set angle, a curved portion (250) connecting one end portion of the first planar portion (210) and one end portion of the second planar portion (220), and a third planar portion (230) bent from another end portion of the second planar portion (220) to extend therefrom and disposed such that an intersection angle ($\theta 2$) with respect to the first planar portion (210) becomes a second set angle that is less than the first set angle; and
   side plates (400) respectively formed on opposite sides of the back plate (200) so as to define a loading space, together with the back plate (200).

2. The bucket of claim 1, wherein the second set angle is lower than the first set angle.

3. The bucket of claim 1, wherein the side plate (400) comprises:

   a first side (401) relatively adjacent to the first planar portion (210) of the back plate (200) and parallel to the first planar portion (210);
   a second side (402) relatively adjacent to the second planar portion (220) and the third planar portion (230) of the back plate (200) and parallel to the first side (401);
   a third side (403) connecting one end portion of the first side (401) relatively adjacent to another end portion of the first planar portion (210) of the back plate (200), and one end portion of the second side (402) relatively adjacent to the third planar portion (230) of the back plate (200); and
   a fourth side (404) connecting another end portion of the first side (401) and another end portion of the second side (402).

4. The bucket of claim 3, wherein a length between one end portion and another end portion of the first planar portion (210) of the back plate (200) is longer than a length between one end portion and another end portion of the second planar portion (220) and shorter than the fourth side (404) of the side plate (400).

5. The bucket of claim 3, wherein the third side (403) is a line convexly curved in a direction opposite to a direction of the curved portion (250) of the back plate (200).

6. The bucket of claim 3, wherein an intersection angle between the second side (402) and the fourth side (404) is greater than the first set angle by 20 degrees or more.

7. The bucket of claim 1, further comprising a side cutter (740) coupled to one end portion of the fourth side (404) of the side plate (400) that is relatively adjacent to the first planar portion (210), wherein a blade (743) is formed at the side cutter (740) in a direction parallel to the side plate (400).

8. The bucket of claim 1, further comprising a horizontal support coupled to an outer surface of the second planar portion (220) of the back plate (200), the horizontal support having a length in a horizontal direction.

**9.** The bucket of claim 1, further comprising a spill prevention plate (800) coupled to the third planar portion (230) of the back plate (200), the spill prevention plate (800) protruding from an end portion of the third planar portion (230) in a direction opposite to a direction of the second planar portion (220).

**10.** The bucket of claim 1, further comprising:

a vertical support frame (500) coupled to outer surfaces of the curved portion (250) and the second planar portion (220) of the back plate (200), having a length in a vertical direction, and defined with a coupling hole (509) so as to be installed at the construction machine; and
a bottom plate (550) coupled to the vertical support frame (500) so as to protrude by a predetermined thickness in a direction perpendicular to an outer surface of the first planar portion (210) of the back plate (200).

**11.** The bucket of claim 1, further comprising a plurality of teeth (700) coupled to another end portion of the first planar portion (210) of the back plate (200).

Fig. 1

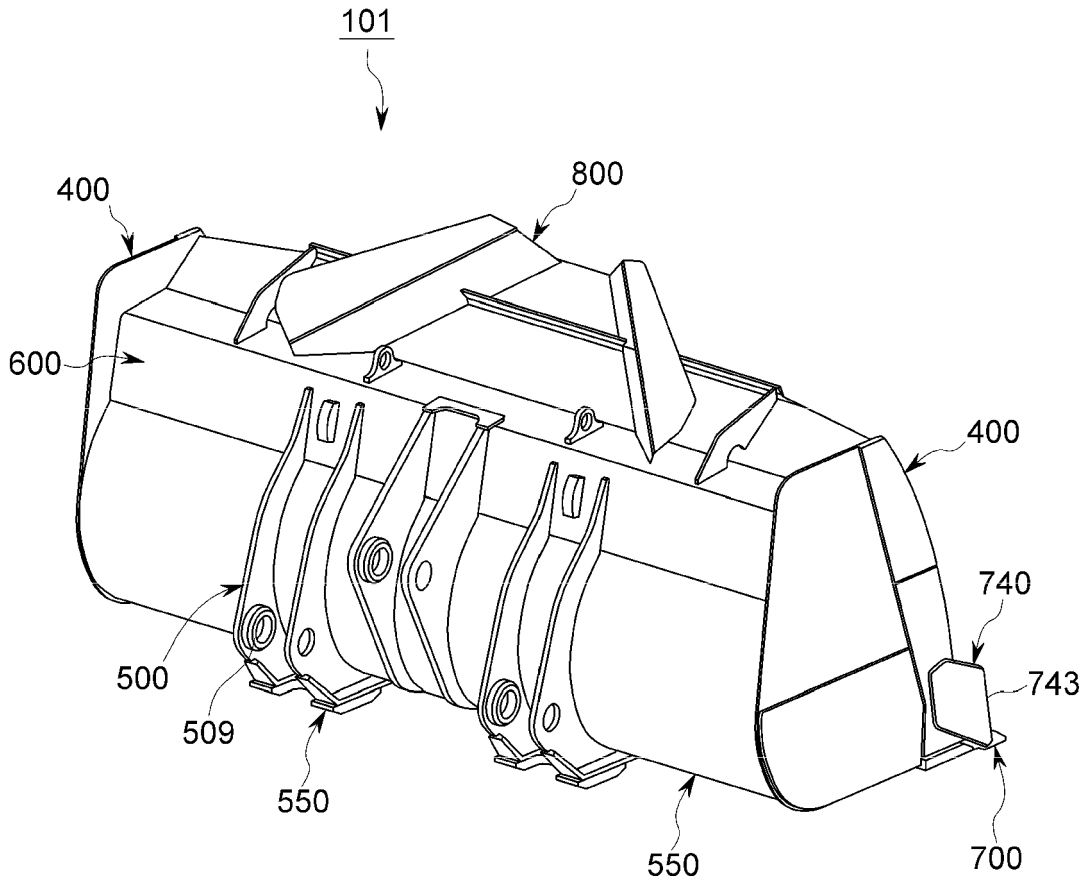
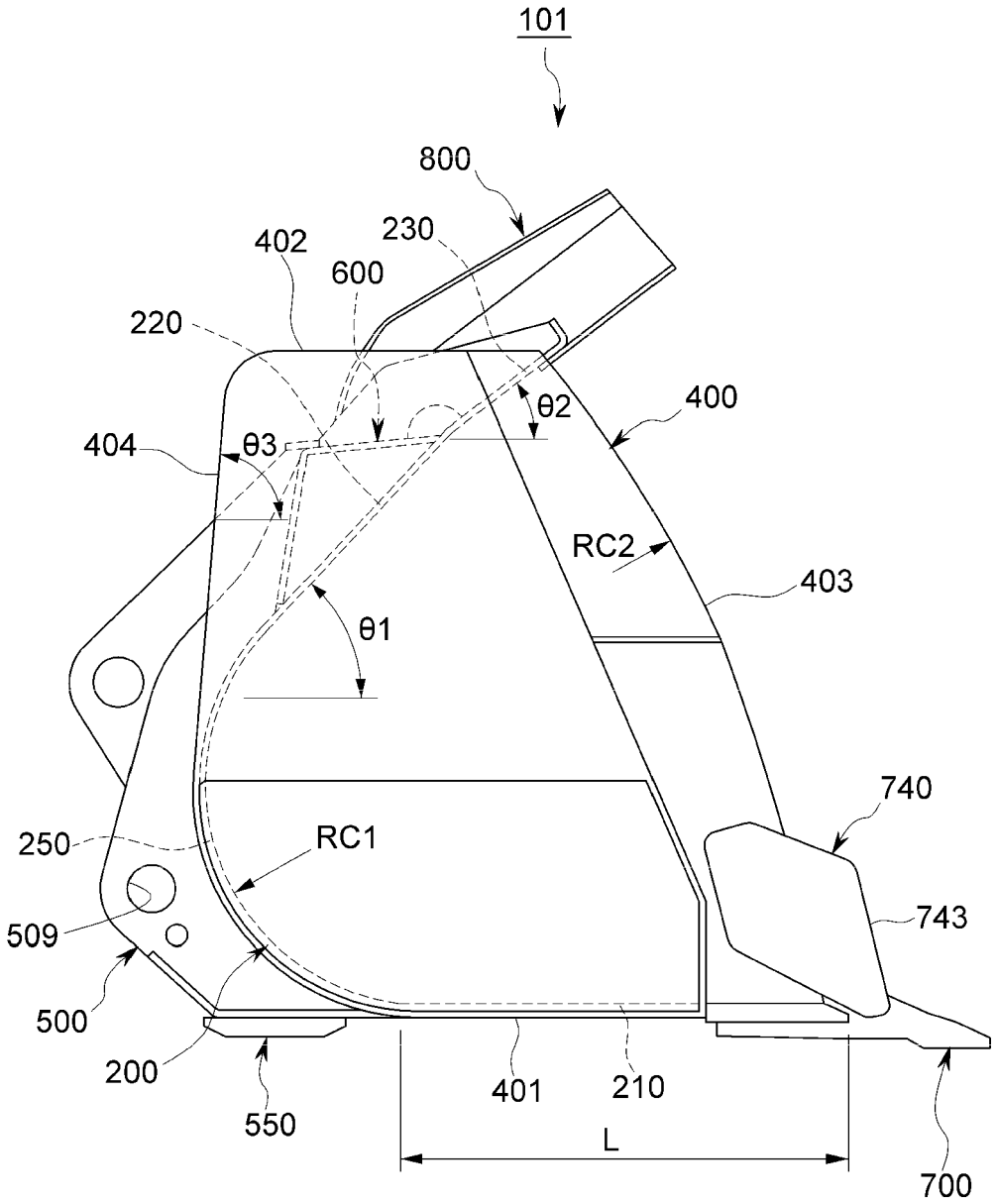


Fig. 2


101
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# EUROPEAN SEARCH REPORT

Application Number
EP 20 17 3090

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E02F

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
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CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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## ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 20 17 3090

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