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(71) Applicants:
- **An, Jang Sook**
  Iksan-si, Jeollabuk-do 54636 (KR)
- **Huller, Stefano**
  Lesignano de' Bagni(Parma) 43037 (IT)

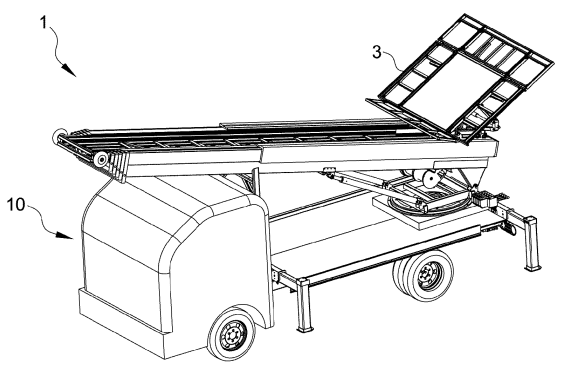
(72) Inventor: **LIM, Dae Woo**
Iksan-si, Jeollabuk-do 54636 (KR)

(74) Representative: **Perani & Partners S.p.A.**
Piazza Armando Diaz, 7
20123 Milano (IT)

(54) LATERAL REINFORCEMENT TYPE BOOM FOR LADDER TRUCK

(57) The present invention relates to a lateral reinforcement type boom for a ladder truck, the boom comprising: a main boom (11) which is rotatably installed in a vehicle (10) and extends such that multistage protraction/retraction is possible; and auxiliary booms (13) which are coupled to each of opposite side surfaces in a transverse direction of the main boom (11) such that multistage protraction/retraction is possible, therefore since the main boom can be reinforced by the auxiliary boom at opposite sides, the overall bending strength of the boom and the strength against lateral load can be further improved. In addition, an extension ladder which is mounted on the lower end of the main boom to be relatively movable along the main boom so as to extend to the ground when the ladder truck is in operation so that a carriage of the ladder truck can descend to the ground, and thus the extension ladder is coupled to an upper surface on a lower end of the main boom in which the auxiliary booms for reinforcement are coupled to opposite side surface thereof such that the extension ladder can relatively move to extend to the ground. Therefore, the carriage moving on the boom is lowered close to the ground by using the extension ladder so that luggage can be easily moved up and down to the carriage.

[도3]



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Description

Technical Field

[0001] The present invention relates to a lateral reinforcement type boom for a ladder truck, and more specifically, a lateral reinforcement type boom for a ladder truck, which, by attaching auxiliary booms on the sides of the main boom, significantly improves the strength against bending loads, as well as the yield strength against local partial loads caused by the carriage and the strength against lateral loads applied in the transverse direction.

Background of the Invention

[0002] In general, a ladder truck is a vehicle that can transport carriages and other loads from ground level to an elevated position by telescoping a multi-stage boom, and its performance depends on the strength of the boom, which determines the carrying height.

[0003] An example of such a boom for a ladder truck is the ladder truck boom shown in Drawing 1 (U.S. Patent No. 10-1763649). This boom (110) is mounted rotatably on the vehicle (101), as shown, and the elevation angle is determined by an angle adjustment cylinder (104). Thus, when the boom (110) is extended upward, it moves the carriage (120) to its intended position for its intended use.

[0004] However, due to the structural limitations of the conventional boom (110) for telescoping, the boom-to-boom folding occurs between the booms. In particular, each boom has an open structure in cross-section to allow movement of the carriage (120) while still being folded, resulting in poor bending strength.

[0005] In addition, the outer boom, which does not fold on the outer surface, can be sufficiently reinforced on the outer surface, but the other booms cannot provide any reinforcement means on the outer surface to maintain the folding. In particular, the second boom, which cannot be reinforced and is the lowest boom, i.e., the one comes right after the outer boom, has the largest load burden and the most vulnerable in terms of strength.

[0006] Moreover, although the strength of the boom itself can be increased, doing so increases the weight and multiplies the above weakness. When extended to a height, there is nothing to prevent it from bending, breaking and twisting sideways under lateral loads from external forces, such as sideways wind or swaying.

[0007] Moreover, for the conventional boom (110), although the strength of the boom itself can be increased, doing so increases the weight and multiplies the above weakness. When extended to a height, there is nothing to prevent it from bending, breaking and twisting sideways under lateral loads from external forces, such as sideways wind or swaying.

[0008] On the other hand, the boom of the ladder truck should be equipped with an extension ladder so that the carriage can be lowered close to the ground. As one example, the "Extension ladder attachment device" of Public Utility Model Publication No. 20-1994-0022909, shown in Drawing 1, has a joint member (204) at the rear end of the ladder part (203), and an extension ladder (202) coupled to the joint member (204) to connect with the ladder part (203), so that the carriage (205) can be moved from the ladder part (203) to the extension ladder (202) and lowered close to the ground.

[0009] However, when the above-mentioned conventional extension ladder (202) is used in a ladder truck, it is directly connected to the end of the ladder part (203) and remains exposed to the outside at all times, so that it protrudes from the rear end of the ladder part (203) even when the ladder truck is not in use and occupies a considerable space at the rear of the ladder truck. Therefore, there is a problem that the driver may not be aware of the space occupied by the extension ladder when driving or parking the ladder car with the ladder part folded and not in use, and an accident may occur.

[0010] Therefore, it is necessary to provide a structure for storing the extension ladder when it is not in use. Specifically, the extension ladder must be connected to the outermost boom of the main boom in contact with the outer boom, and in a structure in which the main boom is reinforced by installing reinforcing booms as described above, especially in a structure in which the reinforcing boom is installed on the side of the main boom so that the load can be distributed as much as possible, the auxiliary boom is located on the side of the main boom, so it is difficult to arrange the position where the extension ladder is to be combined to be accommodated on the side of the outer boom.

Detailed Description of the Invention

Technical Objectives

[0011] The present invention is proposed to solve the above problems of the conventional boom for ladder truck, and aims to improve the overall strength of the boom against bending loads, especially the load on the leading edge in the elongated state and the bending load due to its own weight, by reinforcing the main boom with auxiliary booms on both sides of the main boom, while reducing the weight of the boom itself by doubling the rigidity of the boom as described above.

[0012] In addition, it has another object to improve the strength of the boom against lateral load.

[0013] Also, it has another object to improve the local yield strength of the main boom by distributing the load locally generated on the main boom due to the carriage to the auxiliary boom.

[0014] The present invention also has another object to provide a ladder truck boom with a main boom with auxiliary booms on the side for reinforcement and an extension ladder that can be used in combination with the main boom for relative movement in order to solve the

problems of ladder truck booms with conventional extension ladders as above.

[0015] Also, the present invention has another object to provide a ladder truck boom with an extension ladder that prevents the carriage from moving sideways while resting on the extension ladder when the carriage is moved by the extension ladder.

[0016] Also, the present invention has another object to provide a ladder truck boom with an extension ladder that is rigidly coupled to the main boom even when the auxiliary boom is positioned to the side of the main boom.

Means of Solving the Problems

[0017] To achieve these objectives, the present invention provides a lateral reinforcement type boom for a ladder truck comprising: a main boom rotatably mounted on the vehicle, extending telescopically in multiple steps; and auxiliary booms, coupled telescopically in multiple steps to each of two transverse sides of the main boom.

[0018] Further, the auxiliary booms preferably comprise: a plurality of auxiliary booms foldably coupled so as to have a decreasing cross-sectional area; and a plurality of brackets coupled to project laterally on the sides of the leading edges of the main booms to support leading edge portions of the respective auxiliary booms.

[0019] Furthermore, the auxiliary booms corresponding to the outer boom connected to the vehicle, of the booms of the main boom, are preferably attached to both sides of the outer boom.

[0020] Further, each of the plurality of auxiliary booms preferably has a circular or elliptical cross-sectional shape.

[0021] Further, each of the plurality of auxiliary booms preferably has a polygonal shape.

[0022] In addition, it is preferable to include an extension ladder that is mounted at the bottom of the main boom so as to be able to move relatively along the main boom and extends to the ground when the ladder truck is in operation, allowing the carriage of the ladder truck to descend to the ground.

[0023] In addition, it is desirable for the extension ladder to be supported at the top of an outer boom positioned at the outermost of the plurality of auxiliary booms and to be guided for movement along the main boom by a fixing band attached to an upper surface of the auxiliary boom positioned at the outermost of the booms.

[0024] In addition, preferably, the fixing band comprises a roller portion along which the extension ladder is guided so that it can slide, and a roller of the roller portion fits into a groove formed in the extension ladder to secure the extension ladder when the extension ladder is drawn in the upward direction of the main boom.

[0025] In addition, the fixing band preferably has a fixing part for pressing the roller part toward the groove part so that the roller is fixed to the groove part when the extension ladder is drawn in the upper direction of the main boom.

[0026] Further, the extension ladder preferably comprises a pair of roller plates extending longitudinally to support the wheels of the carriage; and an anti-falling bumper projecting upwardly along an outer edge of the roller plates to prevent the wheels rolling on the roller plates from falling off the outer edge of the roller plates.

[0027] In addition, the extension ladder preferably includes a guide bumper which is integrally formed on the outer surface of the anti-falling bump to guide the movement along the main boom by being inserted into the guide groove formed between the upper part of the outer wall of the outer boom and the lower part of the inner wall of the fixing band, which generates a step according to the height difference between the outermost outer boom of the booms and the auxiliary boom.

Effects of the Invention

[0028] For the lateral reinforcement type boom for a ladder truck in the present invention, both sides of the open main boom can be reinforced by auxiliary booms having a closed cross-sectional shape, thereby improving the overall bending strength of the boom. In particular, it is possible to improve the strength against the load on the leading edge in the extended state and the bending load due to its own weight.

[0029] In addition, as described above, the overall strength of the boom can be increased, so even if the thickness of the main boom is reduced, the increase in weight due to the boom itself or the reinforcing structure can be avoided, thus preventing the loss of strength due to the increase in weight.

[0030] In addition, since the auxiliary booms are arranged continuously on the sides of the main boom, the main boom and the auxiliary booms provide bending resistance in the transverse direction of the load, even if the boom is subjected to lateral forces such as wind by extending the boom and placing it at an elevation. Therefore, it is possible to significantly improve the strength against lateral loads compared to placing the auxiliary booms below the main boom.

[0031] In addition, even if a local load is applied to the main boom by the carriage, the local yield strength of the main boom can be greatly increased because the load is shared between the main boom and the auxiliary booms.

[0032] In addition, since the extension ladder is coupled to the lower upper surface of the main boom with the auxiliary boom for reinforcement coupled to both sides so that it can be moved relative to the ground, the extension ladder can be used to lower the carriage moving on the main boom close to the ground, which makes it easy to load and unload luggage on the carriage.

[0033] In addition, since the anti-falling bump protrudes upward along the outer side of the extension ladder to prevent the wheels of the carriage from falling off from the extension ladder to the side, so that the carriage can be safely used even when the carriage is located on

the extension ladder.

[0034] In addition, the upper surface of the auxiliary boom is coupled with a fixing band to which the extension ladder is relatively movable, a guide groove is formed due to the height difference between the fixing band and the main boom, and a guide bumper formed on the outer surface of the extension ladder is inserted into the guide groove, so that the extension ladder is firmly coupled to the fixing band and the guide groove. As a result, the combined structure of the main boom and the auxiliary boom and the structure of relatively mobile extension ladder securely attached to the main boom by a fixing band can be formed.

[0035] In addition, by forming a roller on the fixing band that guides the extension ladder to move so that the extension ladder slides by the roller, and when the extension ladder is stowed, the roller is pressed into the groove of the extension ladder to be fixed by pressing it into a fixing part, the roller structure can guide and fix the extension ladder at the same time, so that the relative movement and fixation of the extension ladder can be made simple in one configuration.

Brief Explanation of the Drawings

[0036]

Figure 1 illustrates a conventional boom for a ladder truck.

Figure 2 is a perspective drawing of a boom with a conventional extension ladder.

Figure 3 is a perspective drawing of a vehicle with a lateral reinforcement type boom for a ladder truck according to an embodiment of the present invention.

Figure 4 is a perspective drawing of the boom in Figure 3 in its elongated state.

Figure 5 is a perspective drawing of the boom in Figure 3

Figure 6 is an enlarged drawing of part A of Figure 5.

Figure 7 is an exploded perspective drawing of any one boom and its corresponding auxiliary boom and bracket in Figure 5.

Figure 8 is a cross-sectional perspective drawing of part B of Figure 5.

Figure 9 is a base drawing of the boom in Figure 3

Figure 10 is a perspective drawing of a boom for a ladder truck with an extension ladder according to an embodiment of the present invention.

Figure 11 is a perspective drawing of a boom and extension ladder in their extended state in Figure 10.

Figure 12 is a perspective drawing of the main boom, auxiliary booms, and extension ladder of a boom for a ladder truck with an extension ladder according to an embodiment of the present invention.

Figure 13 is an enlarged perspective drawing of a structure of main boom and auxiliary booms being combined in a boom for a ladder truck having an extension ladder according to an embodiment of the present invention.

Figure 14 is a perspective drawing of an extension ladder in its extended state in Figure 12.

Figure 15 is a longitudinal front view illustrating the main boom, auxiliary boom and extension ladder of a boom for a ladder truck with an extension ladder according to one embodiment of the present invention.

Figure 16 is an enlarged drawing of part A of Figure 15.

Figure 17 is an exploded drawing of a fixing band for a boom for a ladder truck with an extension ladder according to an embodiment of the present invention.

Best form of implementation of the invention

[0037] Hereinafter, a lateral reinforcement type boom for a ladder truck according to one embodiment of the present invention will be described in detail with reference to the accompanying drawings.

[0038] The boom of the present invention, as shown in Figures 3 and 4 by Drawing symbol #1, is a part of a vehicle, such as a ladder truck, telescopically extending from the vehicle (10), so that when transported it is folded as shown in Figure 3, and when in use it extends upwardly and serves to elevate the carriage (3) from the bottom connected to the vehicle (10) to the top.

[0039] For this purpose, the boom (1) of the present invention comprises a main boom (11) and an auxiliary boom (13), as shown in Figures 3 to 9.

[0040] Here, the main boom (11) is a main body of the boom (1), rotatably mounted on the vehicle (10) at its lower end, and comprising a plurality of booms (21, 22, 23, 24, 25, 26) for telescopically extending, as shown in Figures 3 and 4.

[0041] In this case, each of the booms (21, 22, 23, 24, 25, 26) comprises a rectangular framing body, i.e., a framing body on both the left and right sides having a '⊏' shaped cross-section, opened upwards and downwards by openings (31), as shown in Figures 8 and 9, to which a plurality of transverse bars (12) are attached to the lower opening (31) to reduce weight and add strength.

[0042] The auxiliary boom (13), as a means for reinforcing the main boom (11) in the transverse direction at both ends of the main boom 11, is coupled to the left and right sides of the main boom (11) in pairs to be stretchable in multiple stages on both sides in the transverse direction of the main boom (11) as shown in Figures 5 to 9. Each has an independent folding structure.

[0043] For this purpose, the auxiliary boom (13) comprises a plurality of auxiliary booms (41, 42, 43, 44, 45) and a plurality of brackets (51, 52, 53, 54, 55), as shown in Figures 5 to 9. Each of the auxiliary booms (41, 42, 43, 44, 45) is a unitary body having a polygonal, such as square, or circular, oval, or track-shaped cross-sectional

shape, as shown in Figures 6 and 8, with a plurality of longitudinal sections for telescoping, and a foldable structure with a decreasing cross-sectional area from bottom to top for folding. Here, drawing symbol #15, shown in Figures 5, 8 and 9 to surround outer boom (21) and auxiliary boom (41), is an extension ladder that extends from boom (1) towards the ground in use, allowing the carriage to lower to the ground to facilitate loading and unloading.

[0044] In particular, each of the auxiliary booms (41, 42, 43, 44, 45) has various cross-sectional shapes as above without openings in the cross-section, preferably a rectangular barrel-shaped cross-sectional shape which is long from top to bottom and short from side to side as shown in Figure 8, considering the moment of inertia of section to cross section area.

[0045] The brackets (51, 52, 53, 54, 55) are means for supporting the leading edge, i.e., the top, of each of the corresponding auxiliary booms (41, 42, 43, 44, 45), and are coupled by projecting laterally to the sides of the leading edge of each of the corresponding booms (21, 22, 23, 24, 25, 26) as shown in Figure 6. The brackets are coupled in such a way that, for example, the 1st bracket (51) is attached to the side of the lower outer boom (21) of the boom (1) that connects to the vehicle (10), and the 5th bracket (55) is attached to the fifth boom (25), respectively. Accordingly, each of the brackets (51, 52, 53, 54, 55) supports a leading edge portion of a corresponding auxiliary boom (41, 42, 43, 44, 45), respectively, in such a way that the 1st bracket (51) supports the auxiliary outer boom (41) and the fifth bracket (55) supports the 5th auxiliary boom (45). For this purpose, each of the brackets (51, 52, 53, 54, 55) is provided with a bore (57) at the top to support the leading edge of the auxiliary booms (41, 42, 43, 44, 45) by fitting the leading edge into this bore (57), as shown in Figures 6 and 7. In particular, the auxiliary boom (41) corresponding to the outer boom (21) is attached to both sides of the outer boom (21) as a whole, thereby increasing the support strength of the auxiliary boom (13). At this time, each of the brackets (51, 52, 53, 54, 55) is in the form of a hollow and thick plate, but as shown in Figure 7, a through groove (59) is notched in the middle part of the side edge to allow the nut (62) to be fixed externally when rotating the transverse adjustment bolt (61) which regulates the transverse displacement of each boom (21, 22, 23, 24, 25, 26) through the adjustment hole (58).

[0046] Now, the behaviour of the lateral reinforcement type boom for a ladder truck (1) according to an embodiment of the invention will be described as follows:

When not in use, the boom (1) of the present invention is stowed in a folded state as shown in Figures 3 and 5, but when in use, the wheels (17) at the front of the boom (1) are extended to reach the destination as shown in Figures 4.

[0047] When extended, the boom (1) resists bending stresses not only through the main boom (11) itself, but also through the auxiliary boom (13), which can significantly increase the bending strength. Therefore, no strength reinforcement is required for the main boom (11) and the reinforcing structure can be omitted, thus reducing the weight load. In particular, since the auxiliary boom (13) has a rectangular cross-sectional shape with a small cross-sectional area and no opening, it is possible to greatly increase the cross-sectional moment of inertia compared to the cross-sectional area, so that the bending strength can be greatly improved.

[0048] Moreover, since the auxiliary boom (13) is placed side by side with the main boom (11) in the transverse direction and shares the local load generated when the carriage (3) passes with the main boom (11), load bearing of the main boom (11) can be reduced. Therefore, the thickness and weight of the main boom (11) itself can be reduced, and the reinforcing structure for the main boom (11) can be removed.

[0049] Furthermore, for loads that are transverse to the main boom (11), the auxiliary boom (13) is placed in line with the main boom (11) in the direction of the load applied to the main boom (11). This greatly improves the strength against lateral loads due to wind or external forces compared to placing the auxiliary boom (13) below the main boom (11).

[0050] On the other hand, according to another embodiment of the present invention, the lateral reinforcement type boom for a ladder truck with an extension ladder will be described in detail as below:

The boom of the present invention, as shown in Figure 10 by Drawing symbol #1, is a part of a vehicle, such as a ladder truck, telescopically extending from the vehicle (10), so that when transported it is folded as shown in Figure 10 and when in use it extends upwardly and serves to elevate the carriage (3) from the bottom connected to the vehicle (10) to the top.

[0051] For this purpose, the boom (1) of the present invention comprises a main boom (11), an auxiliary boom (13), and an extension ladder (15) as shown in Figures 10 to 14.

[0052] The main boom (11) is a main body of the boom (1), rotatably mounted on the vehicle (10) at its lower end, and comprising a plurality of booms (21, 22, 23, 24, 25, 26) for telescopically extending, as shown in Figures 10 and 11.

[0053] In this case, each of the booms (21, 22, 23, 24, 25, 26) is positioned on both sides of the boom (1) by means of a rectangular frame body as shown in Figure 13, and a plurality of cross bars are attached between the booms (21, 22, 23, 24, 25, 26) on both sides to reduce weight and increase strength.

[0054] The auxiliary boom (13), as a means for reinforcing the main boom (11) in the transverse direction at both ends of the main boom (11), is coupled to the left and right sides of the main boom (11) in pairs to be stretchable in multiple stages on both sides in the transverse direction of the main boom (11) as shown in Figures 13. Each has an independent folding structure.

[0055] For this purpose, the auxiliary boom (13) comprises a plurality of auxiliary booms (41, 42, 43, 44, 45)

and a plurality of brackets (51, 52, 53, 54, 55), as shown in Figures 13. Each of the auxiliary booms (41, 42, 43, 44, 45) is a unitary body having a polygonal, such as square, or circular, oval, or track-shaped cross-sectional shape, as shown in Figures 13 and 15, with a plurality of longitudinal sections for telescoping, and a foldable structure with a decreasing cross-sectional area from bottom to top for folding.

[0056] In particular, each of the auxiliary booms (41, 42, 43, 44, 45) has various cross-sectional shapes as above without openings in the cross-section, preferably a rectangular barrel-shaped cross-sectional shape which is long from top to bottom and short from side to side as shown in Figure 15, considering the moment of inertia of section to cross section area.

[0057] The brackets (51, 52, 53, 54, 55) are means for supporting the leading edge, i.e. the top, of each of the corresponding auxiliary booms (41, 42, 43, 44, 45), and are coupled by projecting laterally to the sides of the leading edge of each of the corresponding booms (21, 22, 23, 24, 25, 26) as shown in Figure 13. The brackets are coupled in such a way that, for example, the 1st bracket (51) is attached to the side of the lower outer boom (21) of the boom (1) that connects to the vehicle (10), and the 5th bracket (55) is attached to the fifth boom (25), respectively. Accordingly, each of the brackets (51, 52, 53, 54, 55) supports a leading edge portion of a corresponding auxiliary boom (41, 42, 43, 44, 45), respectively, in such a way that the 1st bracket (51) supports the auxiliary boom (41) and the fifth bracket (55) supports the 5th auxiliary boom (45). For this purpose, each of the brackets (51, 52, 53, 54, 55) is provided with a bore (57) at the top to support the leading edge of the auxiliary booms (41, 42, 43, 44, 45) by fitting the leading edge into this bore (57), as shown in Figures 12 and 13. In particular, the auxiliary boom (41) corresponding to the outer boom (21) is attached to both sides of the outer boom (21) as a whole, thereby increasing the support strength of the auxiliary boom (13).

[0058] Thus, the boom (1) formed as described above combines the main boom (11) with the auxiliary boom (13) so that the load applied to the main boom (11) is resisted by the auxiliary boom (13) together. Thus, by reinforcing the main boom (11) with the auxiliary boom (13), the bending strength of the entire boom can be significantly improved.

[0059] An extension ladder (15) is used to lower the carriage (10) to the ground. It is attached to the lower end of the main boom (11) as shown in Figures 10 and 11, and is attached to a '⊏' shaped mounting bracket (71), as shown in Figures 13 to 16, which is fixedly attached to the upper surface of the outermost of the plurality of auxiliary booms (41, 42, 43, 44, 45) and, as shown in Figures 13 and 14, guided for movement along the main boom (11) and supported on the upper surface of the outer boom (21) positioned at the outermost of the booms (21, 22, 23, 24, 25, 26). And, as shown in Figures 15 and 16, it comprises a roller plate (81) and an anti-fall bumper (82).

[0060] The roller plates (81) are plates supporting the wheels (77) of the carriage (3), and as shown in Figure 15, it is positioned in the transverse direction so that the wheels (77) of the carriage (3) are supported, and since the wheels 77 are located as a pair on both sides, the roller plates (81) are also located at the upper end of the main boom (11) on both sides to extend in the longitudinal direction, respectively, so that the pair support the wheels (77) of the carriage (3). In addition, since they are located parallel to the top of the main boom (11), the wheels (77) of the carriage (3) can easily move over the top of the main boom (11) and the roller plate (81).

[0061] The anti-fall bumper (82) prevents the wheels (77) of the carriage (3) from falling off to the outside of the roller plate (81), and as shown in Figures 15 and 16, it protrudes upward along the outer side of the roller plate (81), and is formed to protrude to fit the height of the fixing band (71) so that its upper end is fitted to the upper surface of the fixing band (71).

[0062] Since the anti-fall bumper (82) prevents the wheel (77) of the carriage (3) from coming off the side of the extension ladder (15), the carriage can be used safely even when the carriage (3) is located on the extension ladder (15).

[0063] On the other hand, when the extension ladder (15) is inserted into the fixing band (71), it may include a guide bumper (83) to be firmly coupled so that it can be moved relative to the main boom (11) in the state where the main boom (11) and the auxiliary boom (13) are combined.

[0064] Guide bumper (83) is integrally projected on the outer surface of the anti-fall bumper (82), opposite anti-fall bumper (82), and is inserted into the guide groove (G) formed between the fixing band (71) and the outer boom (21), as shown in Figures 15 and 16. The guide groove (G) is formed between the upper portion of the outer wall (21a) of the outer boom (21) and the lower portion of the inner wall (71a) of the fixing band (71), which generates a step according to the height difference (t) between the outer boom (21) and the auxiliary boom, as shown in Figure 16, so that the guide bumper (83) can be inserted. As a result, the extension ladder (15) is guided in the guide groove (G) and can be moved relative to the main boom (11).

[0065] Thus, it is advantageous that the extension ladder (15) is firmly coupled to the fixing band (71) and the guide groove (G), thereby forming a coupling structure of the main boom (11) and the auxiliary boom (13) and a firm coupling structure of the extension ladder (15) that is movable relative to the main boom (11) by the fixing band (71).

[0066] In addition, structuring the extension ladder (15) as above has the advantage that the extension ladder (15) can be coupled to the lower upper surface of the main boom (11) to which the auxiliary booms (13) for reinforcement are coupled on both sides so that the ex-

tension ladder (15) can be moved to extend to the ground, so it allows the carriage (3) travelling on the main boom (11) to be lowered close to the ground to facilitate loading and unloading of the load onto the carriage (3).

[0067] On the other hand, the fixing band (71) may be in a form simply surrounding the extension ladder (15), but as shown in Figures 14, 16 and 17, it may be equipped with the roller part (73) in which the roller (73a) is formed so that the extension ladder (15) can be smoothly guided and slide in the longitudinal direction.

[0068] A roller part (73) is coupled to the side of the fixing band (71) in a state where the roller (73a) is rotatably coupled to the roller bracket (73b) as shown in Figures 16 and 17. The roller (73a) comes into contact with the side of the extension ladder (15) through a through groove (71b) perforated in one surface of the fixing band (71) to which the roller part (73) is coupled. Since the roller (73a) keeps the contact with the side surface of the extension ladder (15), the extension ladder (15) is guided and slides in the longitudinal direction.

[0069] In addition, the extension ladder (15) should be fixed so that it does not come out again after being stowed in the upper direction of the main boom (11) when the boom (1) is not in use. Such fixing can be performed using the roller (73a) of the fixing band (71). To this end, as shown in Figure 14, a part of the extension ladder (15) has a groove part (H), and as shown in Figures 15 to 17, the fixing band (71) includes a fixing part (75) that presses the entire roller part (73) into the groove part (H) direction.

[0070] The groove part (H) is formed in a position such that when the extension ladder (15) is stowed in the upward direction of the main boom (11), it moves to the position of the roller (73a) and is aligned to have the roller (73a) inserted, as shown in Figure 14. By the way, while this groove part may be formed in only one part of the extension ladder (15) such that the roller (73a) is only engaged when the extension ladder (15) is fully stow, if multiple groove parts may be formed in any position of the extension ladder (15), the length of the extension ladder (15) extending from the main boom (11) can be adjusted.

[0071] The fixing part (75) is coupled to the side of the fixing band (71) by forming a "⊏" shape so that the fixing bracket (75b) accommodates the roller part (73), as shown in Figure 17. And a screw hole is drilled on a side parallel to the side of the fixing band (71) to engage the fixing lever (75a).

[0072] Thus, as shown in Figure 16, the entire roller part (73) is inserted into the through groove (71b) of the fixing band (71) so that it is movable in the vertical direction of the side of the extension ladder (15). Accordingly, the entire roller portion (73) can be moved and held in the through groove (71b) to a position where the roller (73a) is in contact with the side of the extension ladder (15) so that the roller (73a) can guide the extension ladder (15) during telescoping the extension ladder (15).

[0073] Furthermore, as shown in Figure 16, when the extension ladder (15) is stowed, the entire roller part (73), i.e., the roller bracket (73b), is pressed in the direction of the groove part (H) by the fixing lever (75a) so that the roller (73a) is locked in the groove part (H), and the roller (15) is locked and remains locked.

[0074] In this case, the fixing bracket (75b) is preferably formed such that the inner space is smaller than the thickness in the direction of movement of the roller bracket (73b) in the through groove (71b), as shown in Figure 16, so that the roller bracket (73b) cannot completely slide out of the through groove (71b), as the roller bracket (73) can easily slip out of the through groove (71b).

[0075] Thus, by forming a roller part (73) and a fixing part (75) on the fixing band (71) so that the extension ladder (15) can be fixed by using the roller (73a) that guides the extension ladder (15), the roller structure enables the extension ladder (15) to be guided and fixed at the same time, providing the advantage that the relative movement and fixing of the extension ladder (15) can be made simple in one configuration.

[0076] Specific embodiments of the invention have been described above as examples, but these are only for the purpose of explanation and are not intended to limit the scope of protection of the invention. It will be apparent to those with ordinary skill in the art to which the invention belongs that various substitutions, modifications and changes are possible within the scope of the technical ideas of the present invention.

Industrial applicability

[0077] For the lateral reinforcement type boom for a ladder truck in the present invention, both sides of the open main boom can be reinforced by auxiliary booms having a closed cross-sectional shape, thereby improving the overall bending strength of the boom. In particular, it is possible to improve the strength against the load on the leading edge in the extended state and the bending load due to its own weight.

Claims

1. A lateral reinforcement boom **characterised by** comprising: a main boom (11) rotatably mounted on the vehicle (10) and telescopically extendable in a plurality of steps; and auxiliary booms (13) telescopically coupled to each of two transverse sides of the main boom (11) in a plurality of steps.

2. A lateral reinforcement type boom according to claim 1, which is **characterized in that** the auxiliary boom (13) includes a plurality of auxiliary booms (41, 42, 43, 44, 45) foldingly coupled so as to have a decreasing cross-sectional area;
and a plurality of brackets (51, 52, 53, 54, 55) which support the leading edges of the corresponding auxiliary booms (41, 42, 43, 44, 45) by being coupled

projecting laterally to the sides of the leading edge of each of the corresponding booms (21, 22, 23, 24, 25, 26) of the main boom (11).

3. A lateral reinforcement type boom according to claim 2, which is **characterized in that** the auxiliary outer boom (41) corresponding to the outer boom (21) of the booms (21, 22, 23, 24, 25, 26) of the main boom (11) connected to the vehicle (10) are attached to both sides of the outer boom (21).

4. A lateral reinforcement type boom according to claim 2 or 3, which is **characterized in that** a plurality of auxiliary booms (41, 42, 43, 44, 45) have a circular or oval cross-sectional shape.

5. A lateral reinforcement type boom according to claim 2 or 3, which is **characterized in that** each of the auxiliary booms (41, 42, 43, 44, 45) has polygonal cross-sectional shape.

6. A lateral reinforcement type boom according to any of claims 1 to 3, which is **characterized by** including an extension ladder (15) which is mounted at the bottom of the main boom (11) to be movable along the main boom (11), and allows the carriage (3) of the truck (10) to descend to the ground by being extended to the ground when the ladder truck (10) is in operation.

7. A lateral reinforcement type boom according to claim 6, which is **characterized in that** the extension ladder (15) is guided by fixing band (71) attached to the upper part of the outermost auxiliary boom (41) among a plurality of auxiliary booms (41, 42, 43, 44, 45) so that movement along the main boom (11) is possible, and is supported on top of the outermost boom (21) among the booms (21, 22, 23, 24, 25, 26).

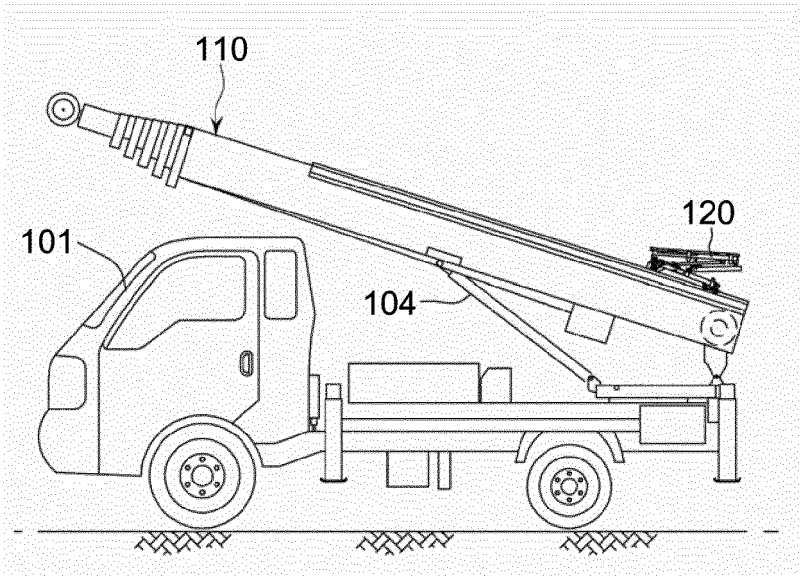
8. A lateral reinforcement type boom according to claim 7, which is **characterized in that** the fixing band (71) is provided with a roller part (73) so that the extension ladder (15) is guided and slides with it. When the extension ladder (15) is stowed in the upper direction of the main boom (11) the roller (73a) of the roller part (73) is inserted into the groove part (H) formed in the extension ladder (15) and makes the extension ladder (15) fixed.

9. A lateral reinforcement type boom according to claim 8, which is **characterized in that** the fixing band (71) has a fixing part (75) which presses the roller part (73) in the direction of the groove part (H) so that the roller (73a) is fixed to the groove part (H) when the extension ladder (15) is stowed in the upper direction of the main boom (11).

10. A lateral reinforcement type boom according to claim 6, which is **characterized by** including: a pair of rolling plate (81) extended in the longitudinal direction to support the wheels (77) of the carriage (3); and an anti-fall bumper (82) protrudes upward along the outer side of the roller plate (81) to prevent the wheels (77) on the rolling plate (81) from falling off to the outside of the roller plate (81).

11. A lateral reinforcement type boom according to claim 10, which is **characterized in that** the extension ladder (15) includes a guide bumper (83) integrally projected on the outer surface of the anti-fall bumper (82) and inserted into the guide groove (G) formed between the upper portion of the outer wall (21a) of the outer boom (21) located at the outermost of the booms (21, 22, 23, 24, 25, 26) and the lower portion of the inner wall (71a) of the fixing band (71) which creates a step according to the height difference (t) between the outer boom (21) and the auxiliary boom (41) so that the extension ladder is guided to move relative to the main boom (11).

[도1]



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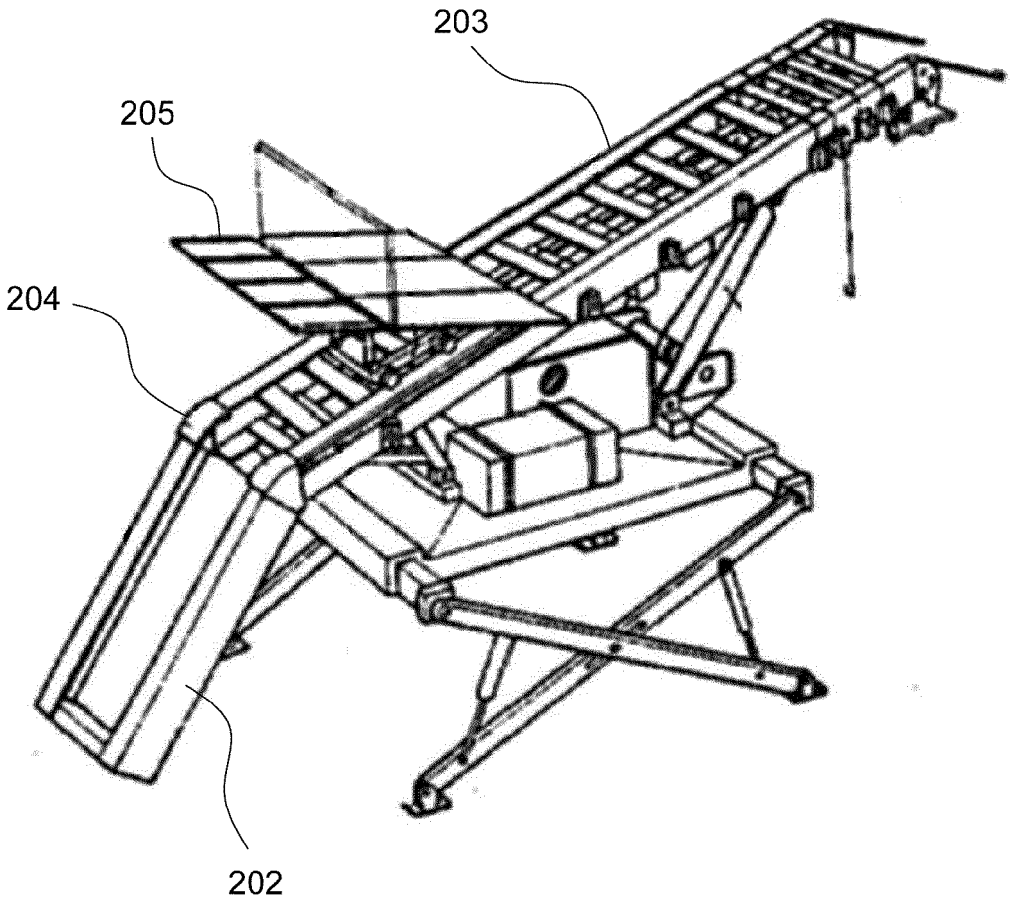

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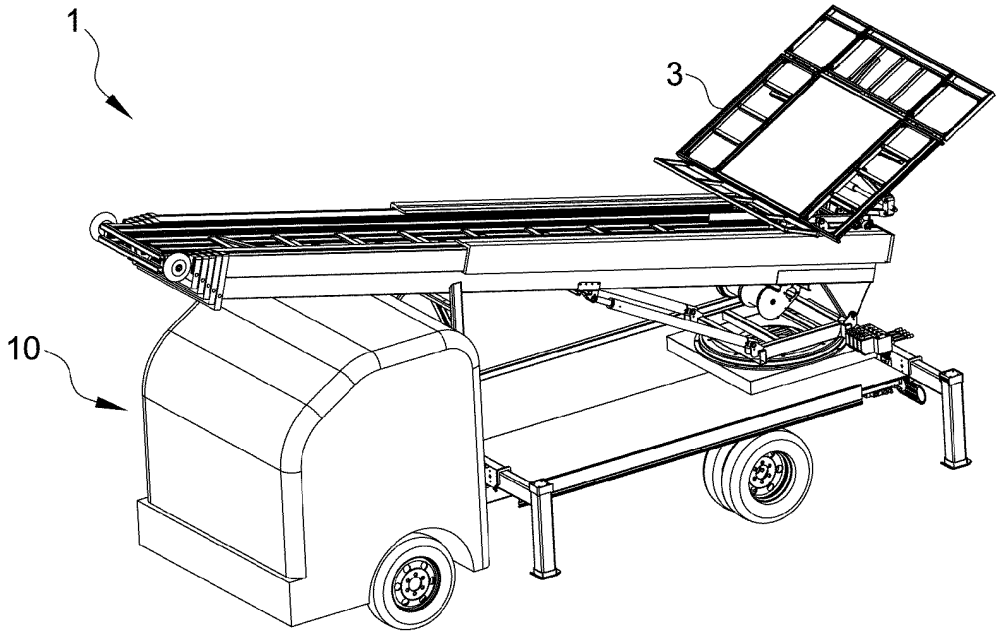

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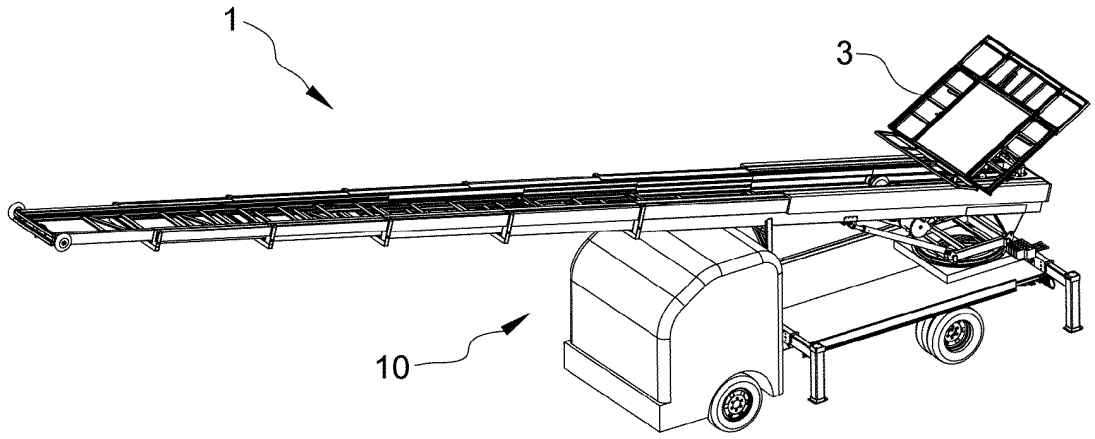

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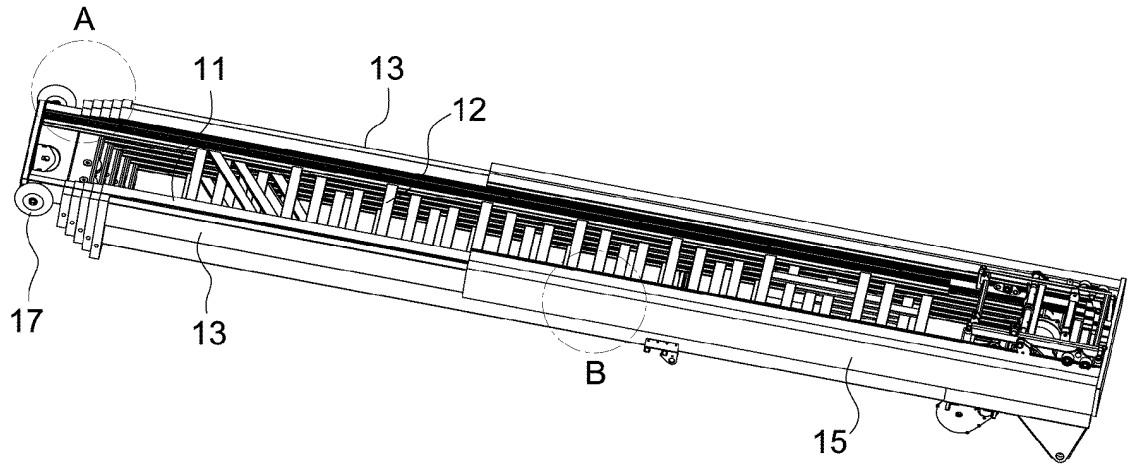

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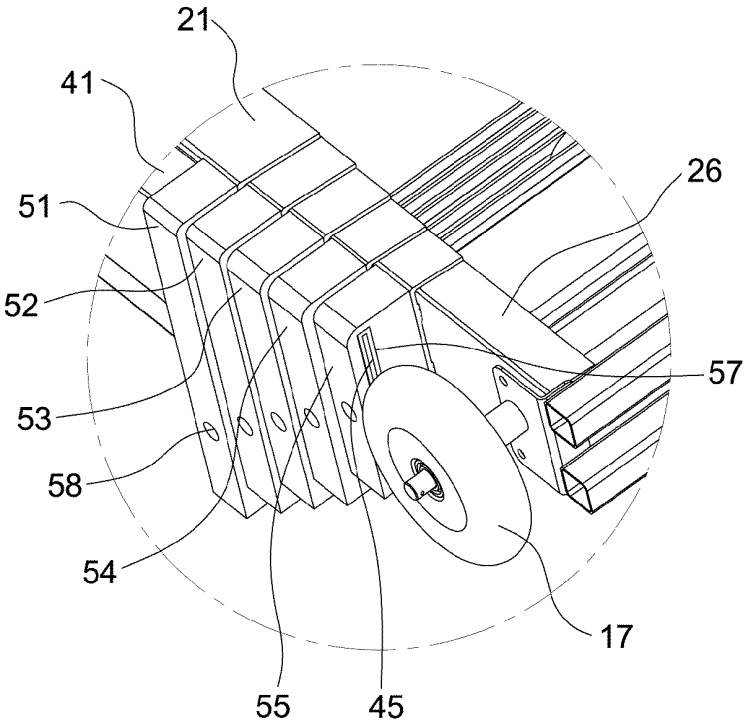

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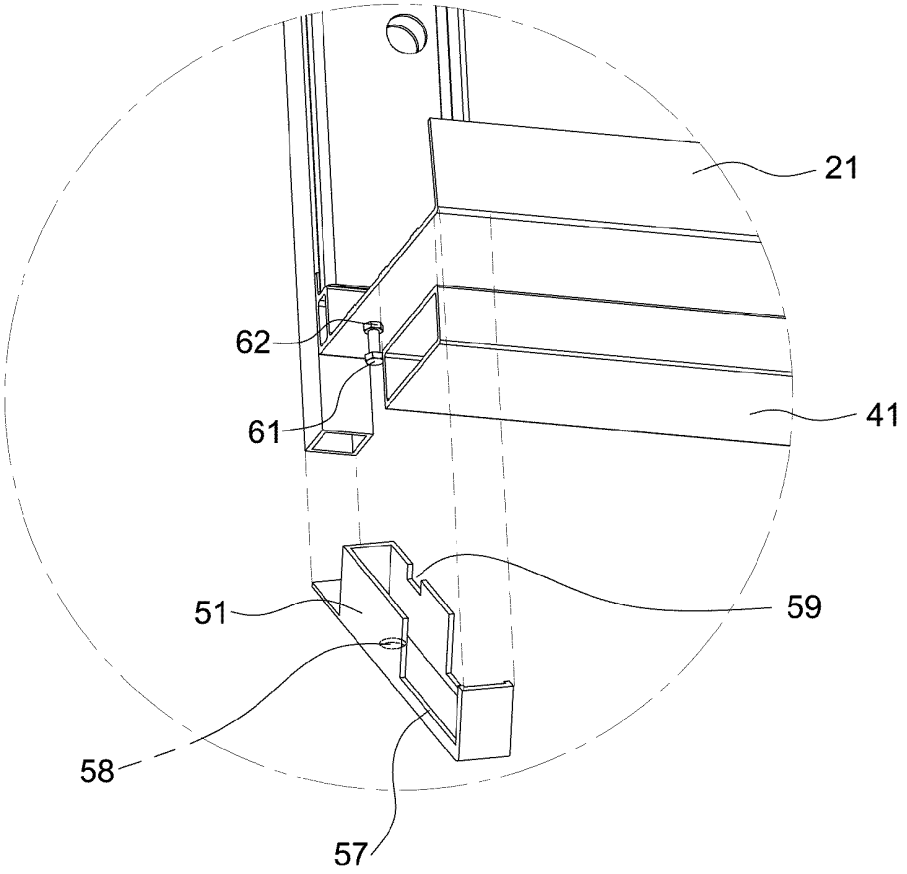

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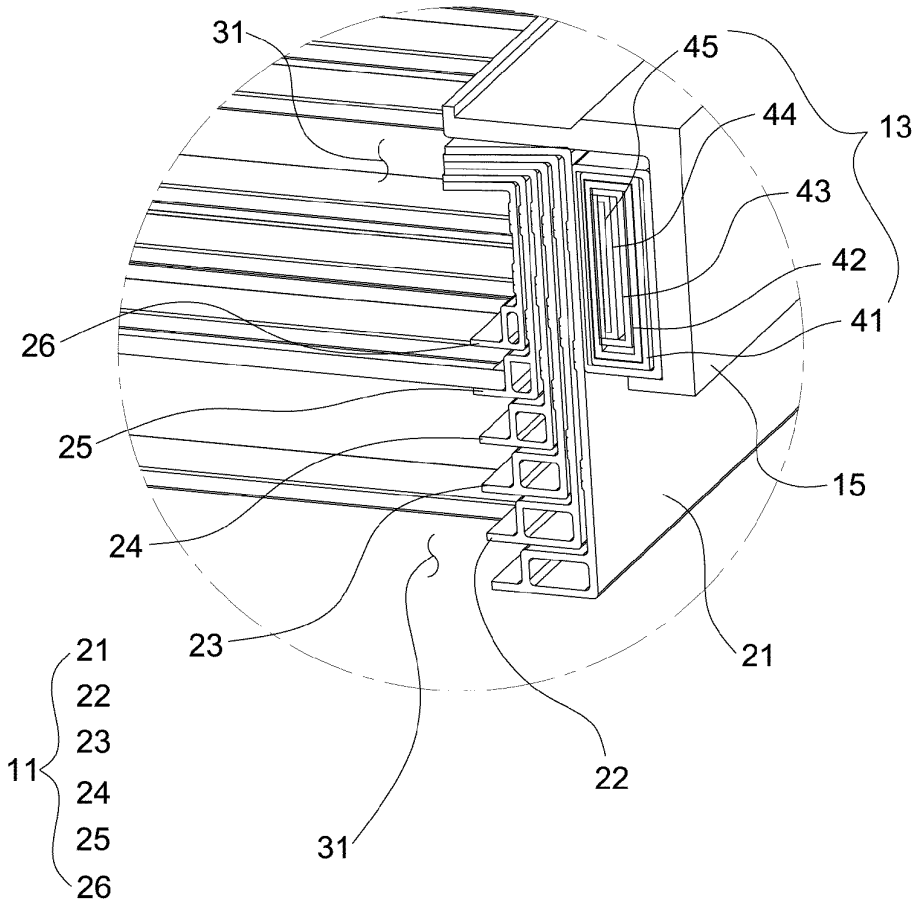
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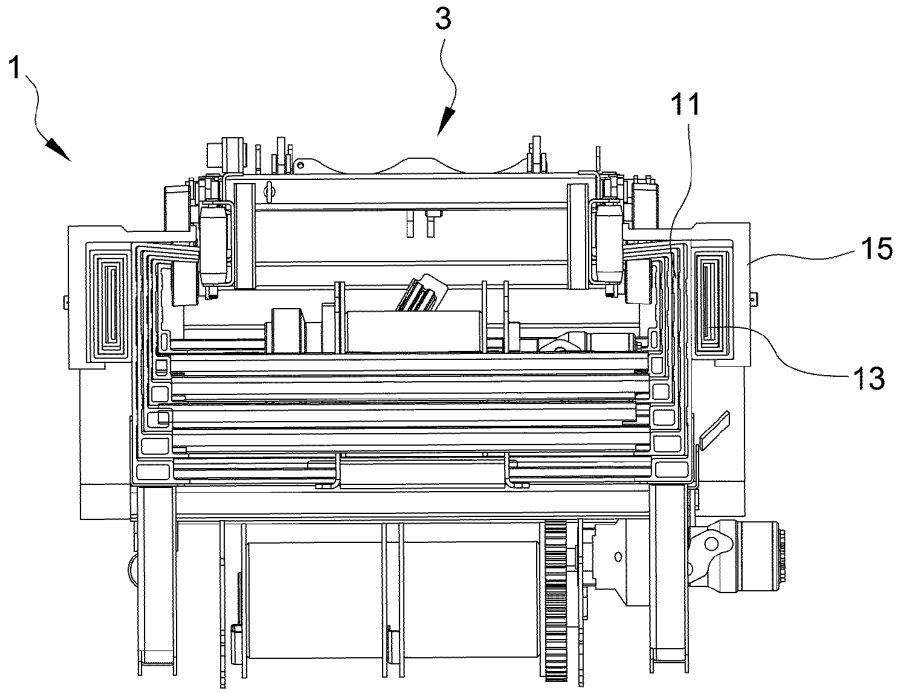
[도9]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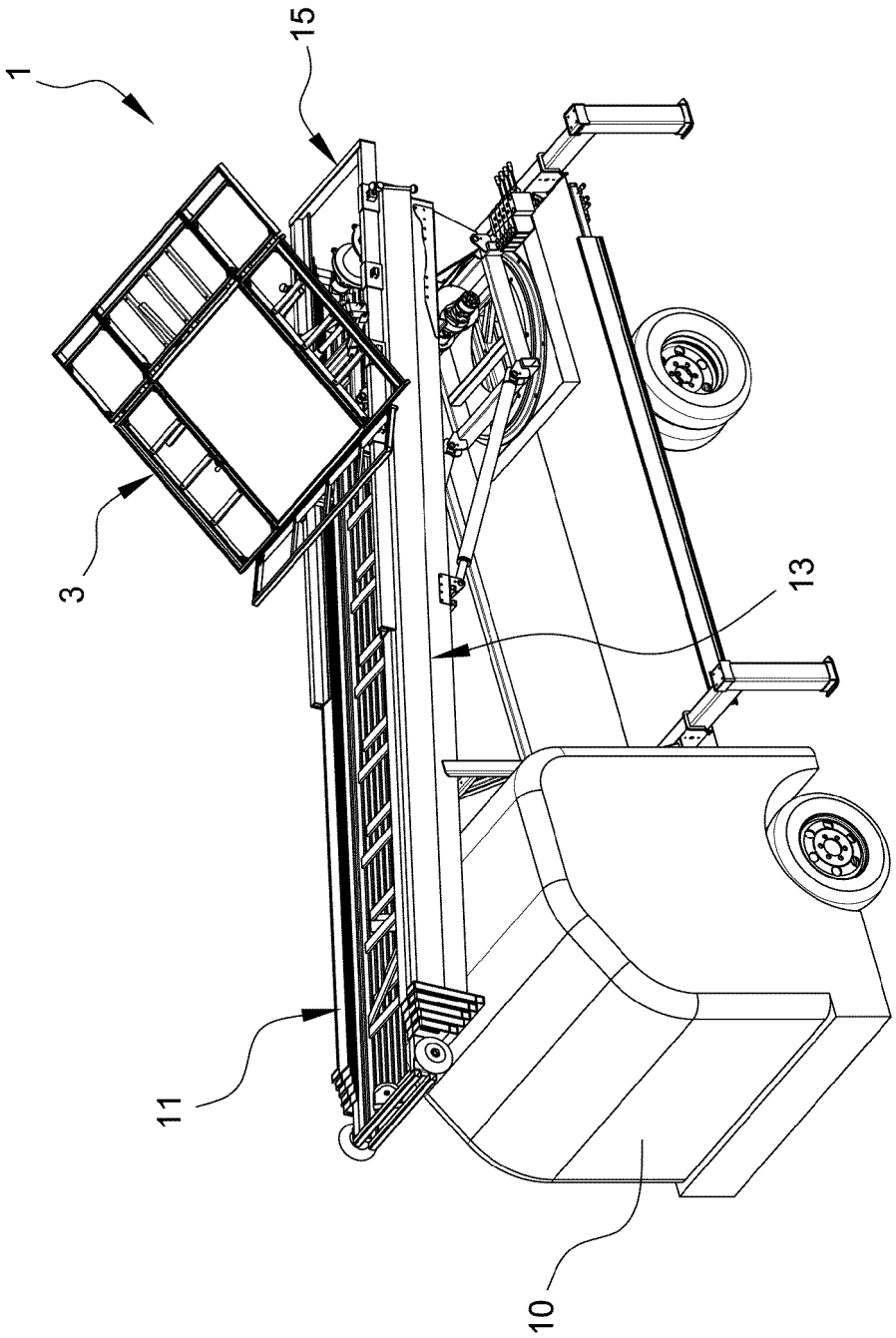

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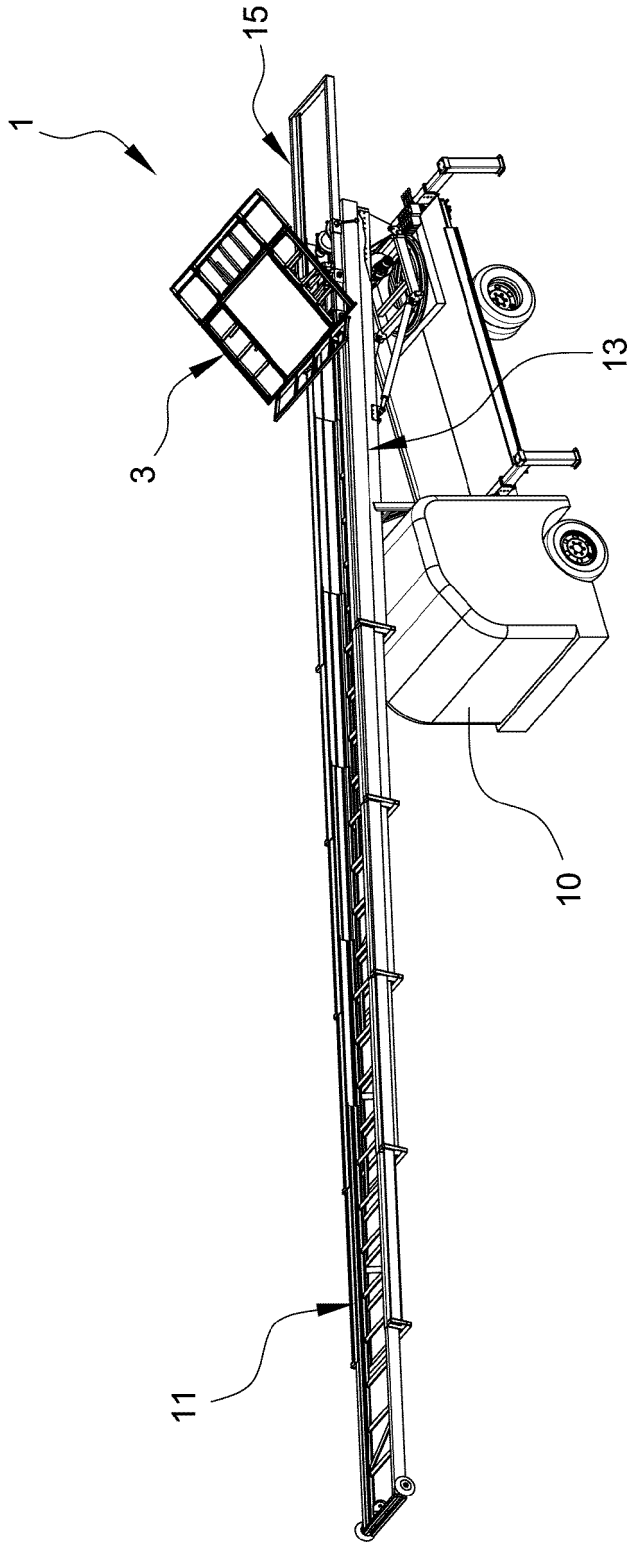

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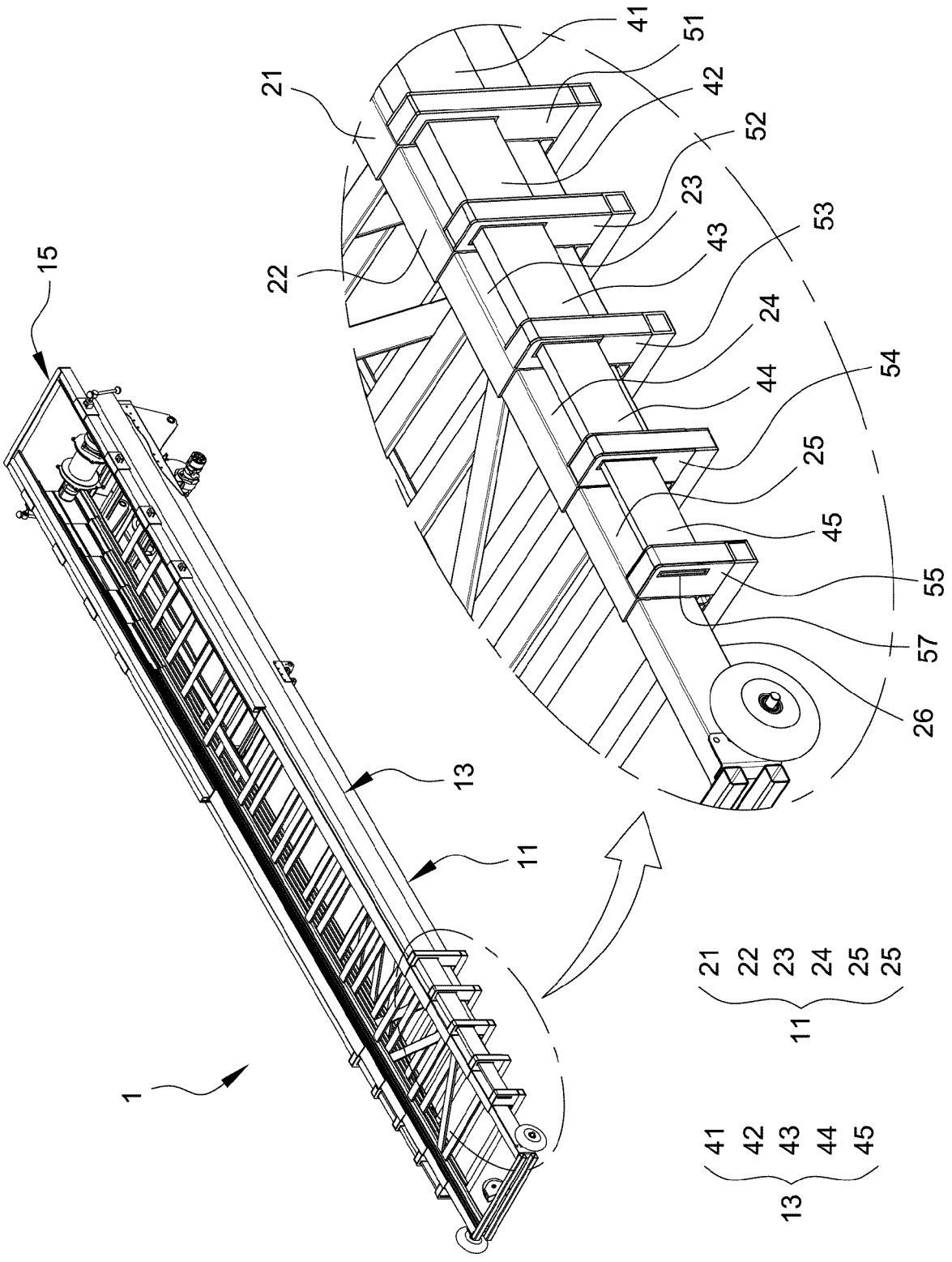

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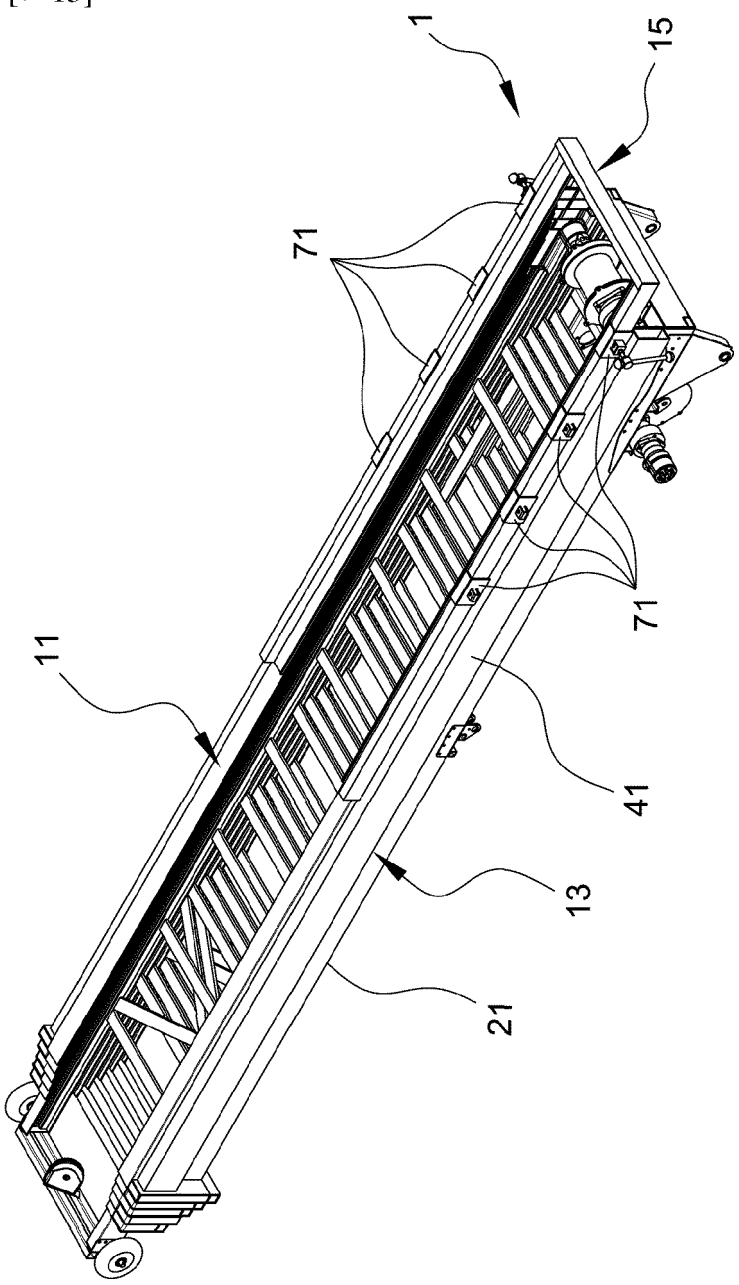

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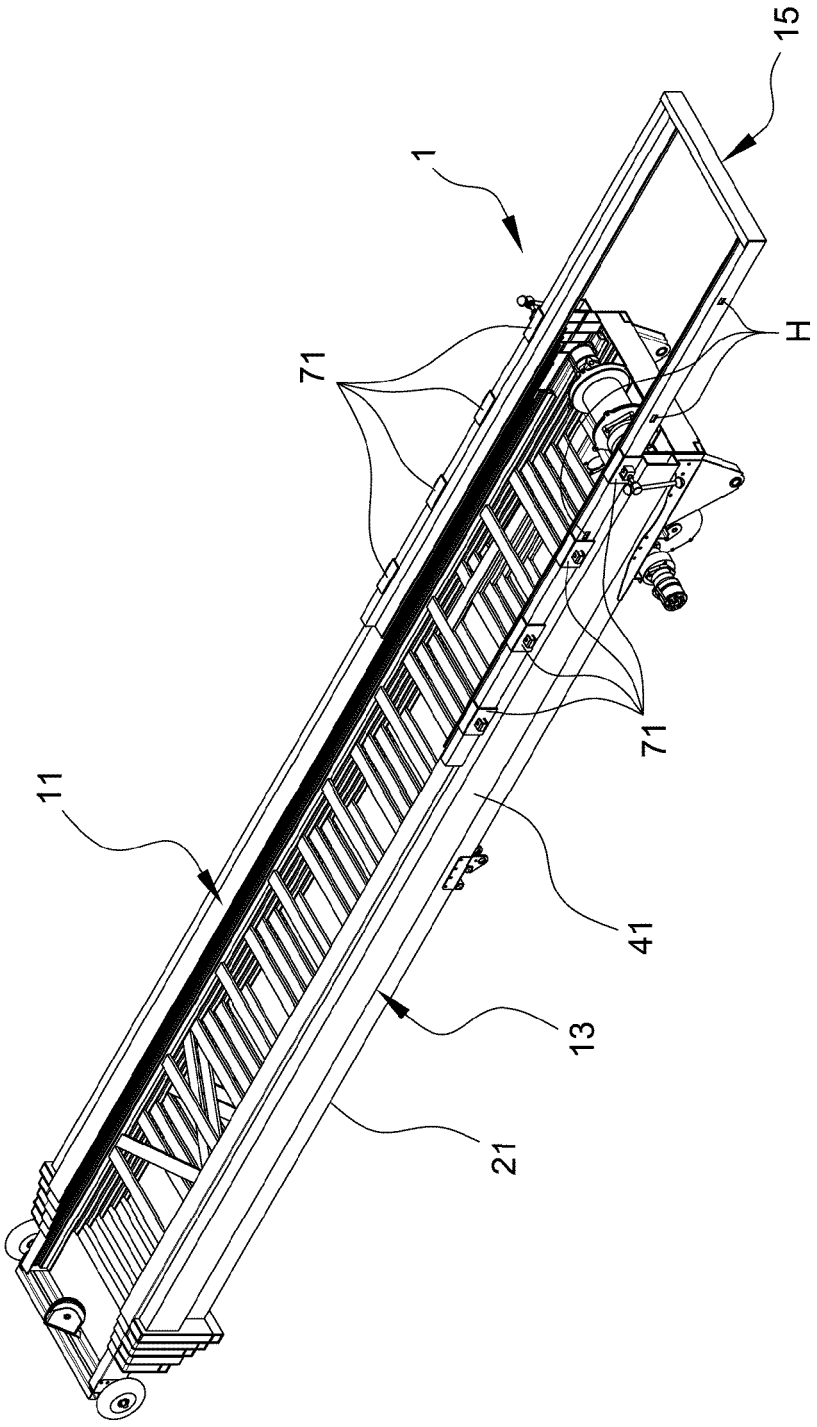

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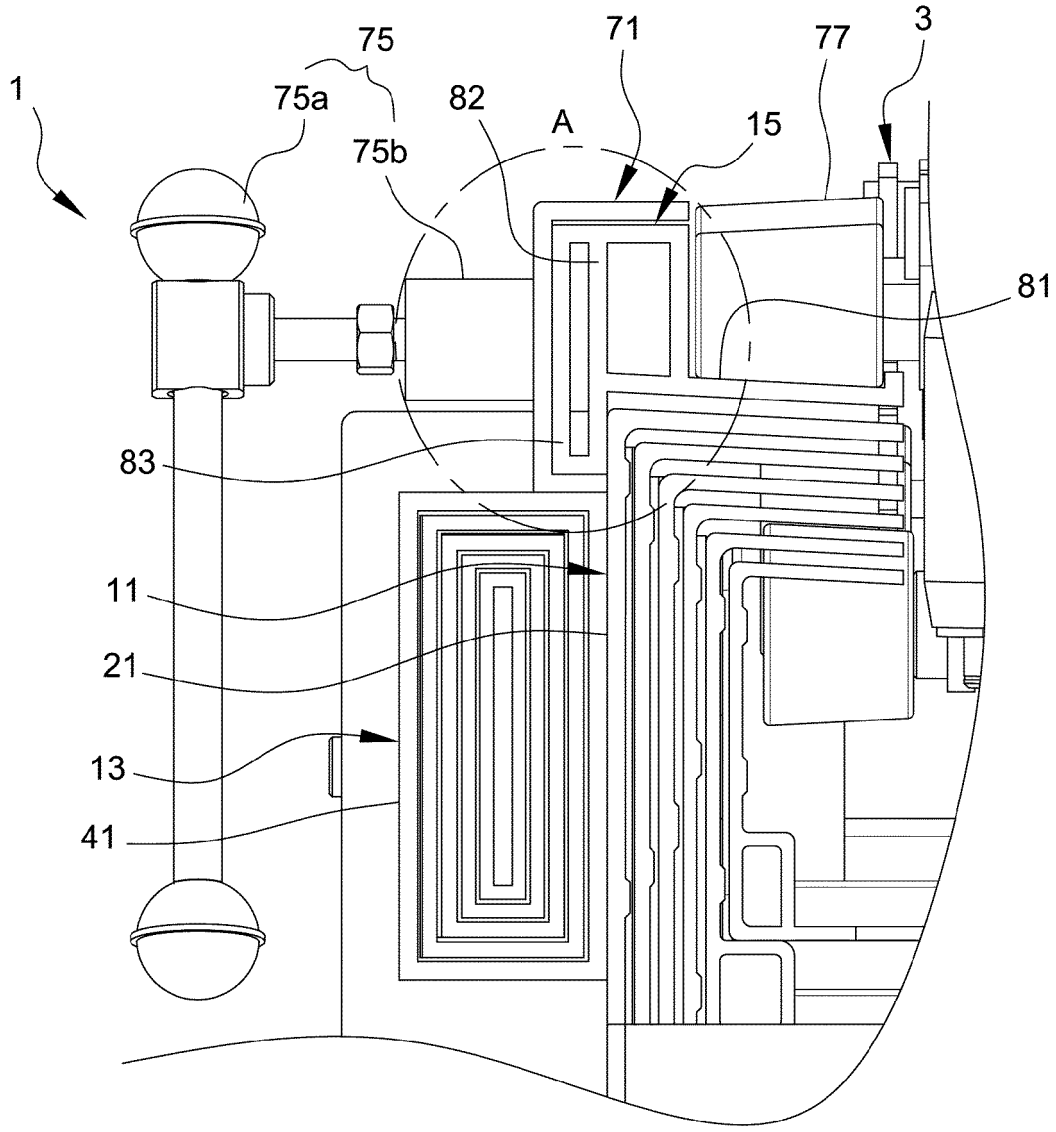

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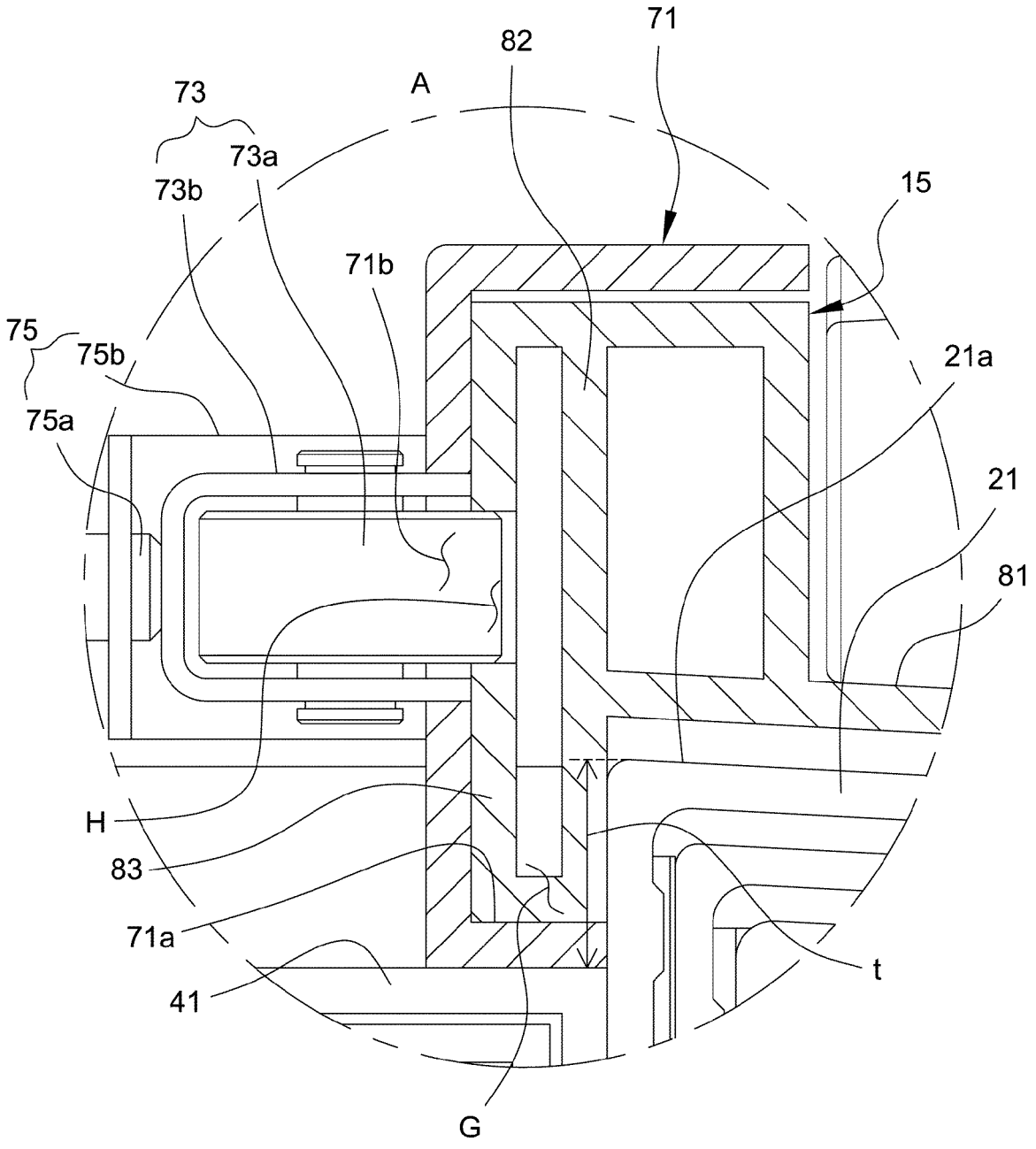

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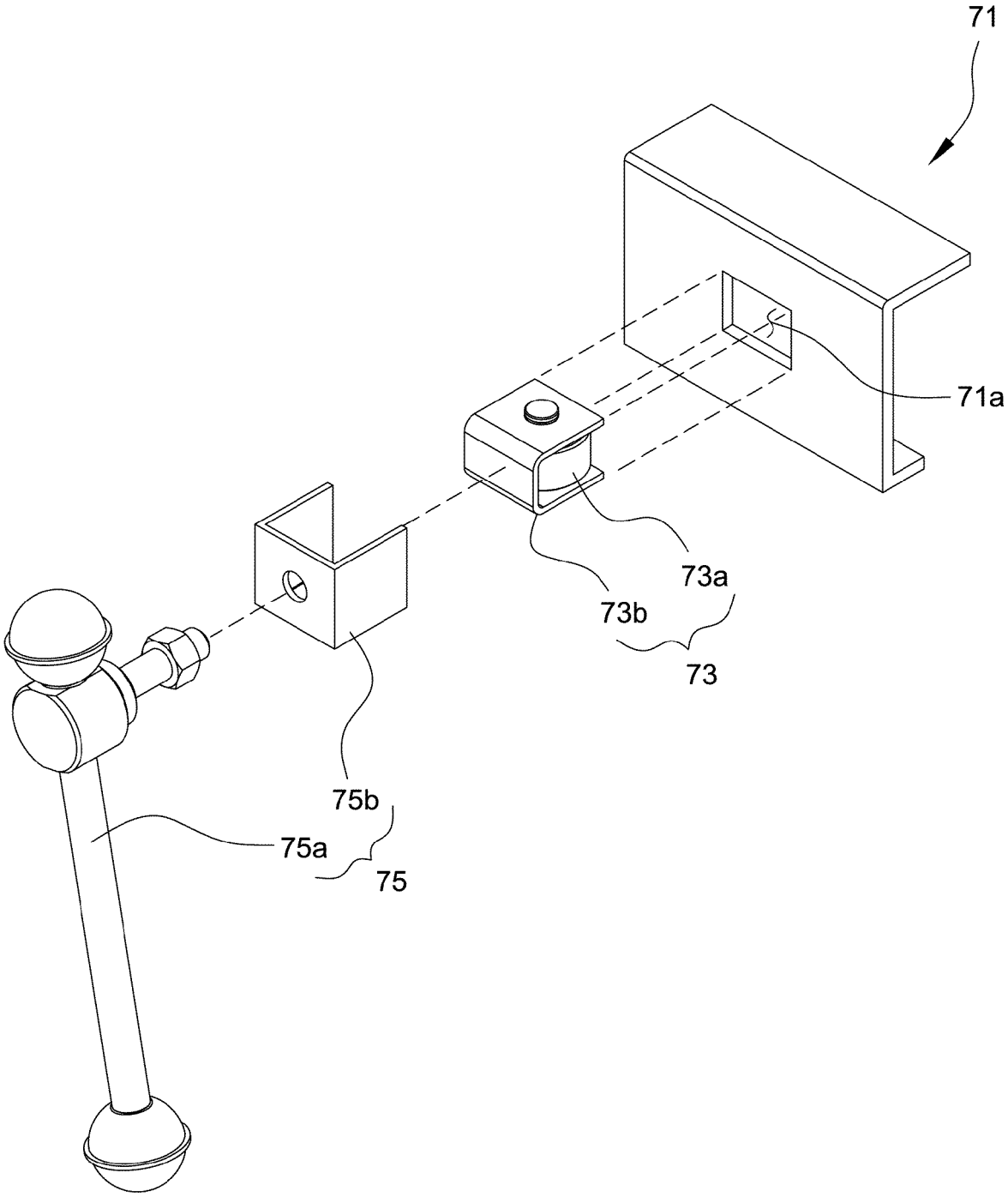

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2021/017629

A. CLASSIFICATION OF SUBJECT MATTER

B66F 11/04(2006.01)i; **B66F 17/00**(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)

B66F 11/04(2006.01); A62C 27/00(2006.01); B66D 1/36(2006.01); B66F 11/00(2006.01); B66F 17/00(2006.01); B66F 9/24(2006.01); E04G 1/22(2006.01); E04G 1/36(2006.01)

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: IPC as above
Japanese utility models and applications for utility models: IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKOMPASS (KIPO internal) & keywords: 사다리차(ladder truck), 붐(boom), 롤러(roller), 안내(guide), 레일(rail), 잠금(locking)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	KR 10-2017-0080758 A (LIM, Dae Woo) 11 July 2017 (2017-07-11) See paragraphs [0017]-[0025] and figures 1-3.	1
Y		6
A		2-5,7-11
Y	KR 20-0258475 Y1 (SAMIL MOTORS CO., LTD.) 28 December 2001 (2001-12-28) See paragraphs [0009]-[0010] and figures 1-5.	6
A	KR 10-1955929 B1 (K-1 INDUSTRY CO., LTD. et al.) 08 March 2019 (2019-03-08) See paragraphs [0048]-[0064] and figure 3.	1-11
A	KR 20-0331396 Y1 (HWANG, Il Ho) 30 October 2003 (2003-10-30) See paragraphs [0012]-[0013] and figures 1-3.	1-11

☑ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

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"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
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 March 2022	**24 March 2022**
Name and mailing address of the ISA/KR **Korean Intellectual Property Office** **Government Complex-Daejeon Building 4, 189 Cheongsa-ro, Seo-gu, Daejeon 35208** Facsimile No. **+82-42-481-8578**	Authorized officer Telephone No.

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2021/017629

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-2146714 B1 (COAS CO., LTD.) 21 August 2020 (2020-08-21) See paragraphs [0026]-[0027] and figures 1-2.	1-11
A	JP 2003-176100 A (AICHI CORP.) 24 June 2003 (2003-06-24) See paragraphs [0010]-[0012] and figures 1-2.	1-11
A	US 4640383 A (NEWBERRY, Claude A.) 03 February 1987 (1987-02-03) See claim 1 and figure 1.	1-11
PX	KR 10-2275660 B1 (LIM, Dae Woo et al.) 09 July 2021 (2021-07-09) See claims 1 and 3-5 and figures 1-8. ("This document is a published earlier application that serves as a basis for claiming priority of the present international application.")	1-11

Form PCT/ISA/210 (second sheet) (July 2019)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2021/017629

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
KR 10-2017-0080758 A	11 July 2017	KR 10-1762771 B1	28 July 2017
KR 20-0258475 Y1	28 December 2001	None	
KR 10-1955929 B1	08 March 2019	None	
KR 20-0331396 Y1	30 October 2003	None	
KR 10-2146714 B1	21 August 2020	None	
JP 2003-176100 A	24 June 2003	JP 3801496 B2	26 July 2006
US 4640383 A	03 February 1987	None	
KR 10-2275660 B1	09 July 2021	None	

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REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 101763649 B **[0003]**
- US 2019940022909 A **[0008]**