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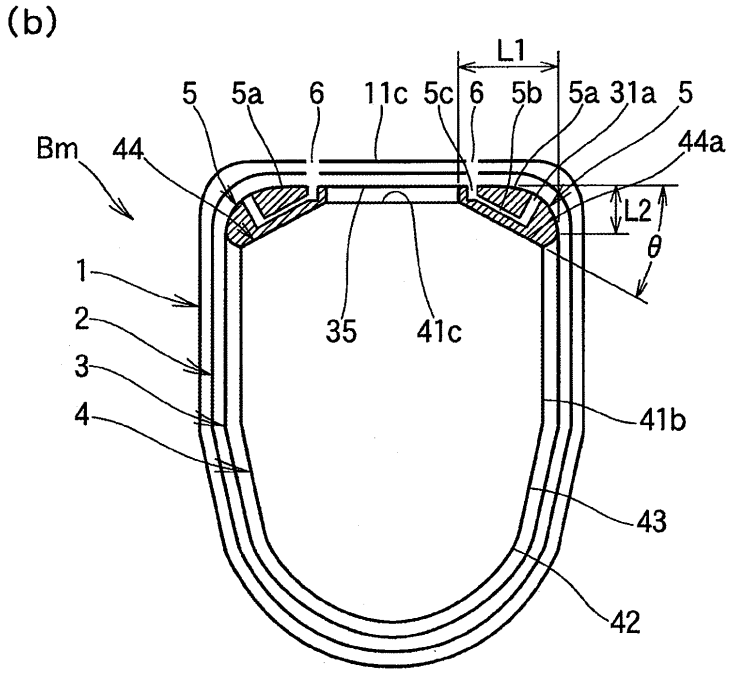
(54) Telescopic boom

(57) An upper slide pad (5) is provided on a base end of a flat top plate (41c) of an inner boom (4) inserted into an outer boom (3) of a telescopic boom (Bm). A slide surface (5a) of the upper slide pad (5) is formed so that a contact length with an inner surface (35) of a flat top plate of the outer boom (3) and an inner surface (31a') of a arc-shaped portion is longer than a contact length with an inner surface of a flat lateral side plate of the outer boom (3) and the inner surface (31a') of the arc-shaped portion.

F I G. 3



EP 2 184 251 A1

Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to an inserted type of telescopic boom. Especially, this invention relates to an improvement made on a slide pad which is used at a rear end of the telescopic boom.

2. Description of Related Art

[0002] On a wheel crane and the like, a base boom and at least one inserted boom are provided as a telescopic boom. The base boom is mounted on an upper revolving body so as to be freely raised or lowered, and the upper revolving body is rotatably mounted on a lower traveling body. The inserted booms are telescopically inserted into the base boom. The base boom and the inserted booms have lower slide pads and upper slide pads respectively. Each lower slide pad is installed on a lower area of an inner plate at a top portion of an outer boom, and it supports an inner boom so that a bottom face of the inner boom can be slid on the lower slide pad. On the other hand, each upper slide pad is installed on an upper area of an outer plate at a rear end portion of the inner boom, and it slides on an upper area of the inner plate of the outer boom. Relating to the slide pad of the telescopic boom like this, the after-mentioned conventional examples 1 and 2 are commonly known.

[0003] The conventional example 1 is described in EP0849212A1. The telescopic boom relating to this conventional example 1 is explained referring to Fig. 6. In the telescopic boom relating to the example 1, arc-shaped portions are provided at upper corners of an outer boom 21 and slanted surfaces are provided at lower corners respectively. Similarly, other slanted surfaces are provided at lower corners of an inner boom 22. Lower slide pads 23' and 23' are located between these slanted surfaces of the inner boom 22 and the outer boom 21. On the other hand, slanted guide surfaces 24 and 24 are provided at upper corners at the rear end of the inner boom 22. Between the arc-shaped upper corners of the outer boom 21 and the guide surfaces 24, upper slide pads 23 and 23 are located. A cylinder 25 extends and retracts the inner boom 22.

[0004] The conventional example 2 is described in EP07025661A1. The telescopic boom relating to the conventional example 2 is explained referring to Fig. 7A through Fig. 7C.

[0005] The telescopic boom relating to the conventional example 2 has an outer boom 41 and an inner boom 42. Between arc-shaped corner portions Ra located at top and rear end areas of the inner boom 42 and arc-shaped corner portions Ri located at top and rear end areas of the outer boom 41, half liners 45 are provided. The half liners 45 are installed between rear end collars 43 and stop collars 44 which are slightly deviated from the rear end collars 43 toward the front end. These half liners 45 correspond to the upper slide pads of the invention. The peripheral surfaces of the half liners 45 are slidably contacted only to the arc-shaped corners Ri, without contacting both the flat inner surface of the top plate and the flat inner surface of the lateral side plate of the outer boom 41. Numerals 46 denote the slide pads which are installed in a front end area of the outer boom 41, and the slide pads 46 support the inner boom 42 so as to slide on the slide pads.

[0006] The slide pads of the telescopic boom as described above need to be lubricated with grease in order to reduce sliding resistance and wearing. As for the technology relating to lubricating with grease, the conventional methods 3 and 4 described below are commonly known.

[0007] The conventional method 3 is described in Japanese Utility Model Laid Open No. SHO 62-17693. At first, based on the conventional method 3, a lubrication apparatus for upper slide pads which are located on a top area of a rear end portion of a boom having a rectangular cross section is explained as an example. Fig. 8A shows a longitudinal cross section at a base end of a four-steps telescopic boom, and Fig. 8B shows a cross section at the line E-E of Fig. 8A. An outermost boom 53 is the base boom. Inside this base boom 53, a second boom 54 is inserted. Inside the second boom 54, a third boom 55 is inserted. Inside the third boom 55, a top boom 56 is inserted. On top plates at base portions of the second boom 54, the third boom 55 and the top boom 56, except for the base boom53, upper slide pads 57, 58 and 59 are provided respectively. Grease nipples 60, 61 and 62 are located over the upper slide pads 57, 58 and 59, and they are installed on a top plate of the base boom 53. The topside of the base boom 53 becomes the upper side of the base boom after it is assembled as a crane.

[0008] Grease is supplied to the upper slide pad 57 installed on the top plate of the second boom 54 from the lubricating nipple 60. The grease which is supplied from the lubricating nipple 61 is sent to the upper slide pad 58 through a grease pocket 66 which is formed between the base boom 53 and the second boom 54, and a grease supply port 63 is prepared on the top plate of the second boom 54. Furthermore, the grease which is supplied from the lubricating nipple 62 is sent to the upper slide pad 59 through a grease pocket 68 formed between the base boom 53 and the second boom 54, a grease supply port 65 prepared on the top plate of the second boom 54, a grease pocket 67 formed between the second boom 54 and the third boom 55, and a grease supply port 64 prepared on the top plate of the third boom 55.

[0009] The conventional method 4 is described in Japanese Patent Laid Open No.2001-158594. Referring to Fig. 9, the other conventional example 4 relating to the grease lubrication is explained. Fig. 9 is a longitudinal section view of a boom showing a layout of a grease supply line when an inner cylinder is in a fully retracted

position. An inner boom 73 is inserted into an outer boom 72 so as to allow its telescopic motion. Near an upper slide pad 74 installed on a top plate 73a of the inner boom 73, a grease supply line 76 is extended from a grease nipple 75 installed on a boom head 71a of the boom 71. Accordingly, in case of the conventional method 4, the upper slide pad 74 is lubricated with the grease supplied to the upper slide plate 74 through the supply line 76 from the grease nipple 75.

[0010] In case of the telescopic boom relating to the above conventional examples 1 and 2, all slide surfaces (surface R) of the upper slide pads installed on the inner boom can slide only on the slide surfaces R located at each right and left corner of the top plate of the outer boom in the lateral direction. When the upper slide pad slides only on the surface R, in order to decrease the pressure at the upper slide pad, it is necessary to widen the upper slide pad along the longitudinal direction of the boom or to enlarge the radius of curvature of the surface R of the upper slide pad and the surface R located at each corner of the top plate of the outer boom.

[0011] In case of widening the upper slide pad, a housing to accommodate the upper slide pad is provided in the inner boom. Accordingly, the upper slide pad must be widened by a certain amount along the longitudinal direction of the boom, so a problem occurs that the length of overhanging at the base end of the inner boom is necessarily extended by the amount, and consequently the overall length of the telescopic boom in its fully shortened (fully retracted) position is also enlarged. Moreover, in case of enlarging the radius of the curvature of the surface R, the sectional strength performance (modulus of section) of the telescopic boom is decreased. Therefore, in order to secure the prescribed crane performance, it is necessary to size up the dimension of the telescopic boom which causes another problem of preventing the boom weight from reducing.

[0012] Moreover, as for lubricating the upper slide pad with grease, in case of the conventional example 3 in which the upper slide pad is installed on each corner of the top plate of the inner boom, it is necessary to provide a grease supply port on the surface R of the outer boom. However, when a supply port is drilled on the stamp-formed surface R, a problem of crack occurs. On the other hand, since the technology relating to the conventional example 4 adopts the grease supply line, such a problem as mentioned above does not occur. However, as the length of the grease supply line becomes as long as the overall length of the boom, it is necessary to use a higher pressure grease pump. In addition, since the number of steps of the telescopic boom increases, the entire grease supply line becomes longer, and consequently the necessity of preventing interference with other telescopic mechanisms makes the layout of the pipeline more complicated.

SUMMARY OF THE INVENTION

[0013] It is an object of the present invention to provide a lighter and sufficiently stronger telescopic boom whose overall length can be shortened in its utmost retracted position. As the overall boom length becomes shorter in its utmost retracted position, the overall boom length can become longer in its utmost extended position.

[0014] It is another object of the present invention to decrease the pressure occurred at the upper slide pad and also to provide the telescopic boom that does not cause any troubles on its grease supply system.

[0015] A telescopic boom of the present invention has an outer boom and at least one inner boom inserted therein. Arc-shaped portions are formed at each right and left corner of a top plate of the inner boom, and a flat top plate and a flat lateral plate are connected integrally with the arc-shaped surface. Facing each right and left corner of the top plate of the outer boom, pad mountings are provided on a base end of a top plate of the inner boom. Upper slide pads are installed on the pad mountings. A slide surface of the upper slide pad is formed so that a contact length with an inner surface of the flat top plate of the outer boom and an inner surface of the arc-shaped portion is longer than a contact length with an inner surface of the flat lateral plate of the outer boom and the inner surface of the arc-shaped portion.

[0016] According to the telescopic boom relating to the present invention, as the contact length with the inner surface of the flat top plate of the outer boom and the inner surface of the arc-shaped portion is longer than the contact length with the inner surface of the flat lateral plate of the outer boom and the inner surface of the arc-shaped portion, the width of the upper slide pad in a boom width direction can be wider and the length of the upper slide pad in the boom longitudinal direction can be shorter. Accordingly, a protrusion length at the base end of the inner boom can be shortened, and an overall length of the telescopic boom in its utmost retracted position is also shortened. In other word, in the case that the overall length of the telescopic boom in its utmost retracted position is same, the present invention can extend the overall length of the telescopic boom in its utmost extended position by the same amount of the shortened protrusion length at the base end of the inner boom. Moreover, since a length of the upper slide pad in the boom width direction is enlarged, the pressure thereon can be decreased. Therefore, as it is not necessary to increase the radius of curvature of the arc-shaped portions of each outer boom and inner boom, the telescopic boom can be slenderized, and the weight of the telescopic boom can be decreased.

[0017] In the telescopic boom of the present invention, it is possible to form a slanted pad fitting surface connected with the flat top plate and the flat lateral plate by cutting out the arc-shaped portion.

[0018] In this preferred embodiment, it is possible to increase the thickness of the upper slide pad and

strengthen the upper slide pad.

[0019] Furthermore, in the telescopic boom of the present invention, an angle between the flat pad fitting surface and the flat top plate of the inner boom can be smaller than 40 degrees.

[0020] In this preferred embodiment, an element of load onto the upper slide pad in the boom width direction, that is a force to dislocate the pad along the lateral direction, can be decreased; therefore it is not necessary to enforce a fastening means for fixing the upper slide pad on the pad mounting.

[0021] Moreover, in the telescopic boom of the present invention, in addition, it is possible to provide grease supply ports and grease guide paths. In this case, the grease supply ports are furnished on the flat top plates or the flat lateral plates of the outer booms. The grease guide path is furnished on the upper slide pad so that it may guide the grease into the inner surface of the arc-shaped portion of the outer boom.

[0022] In this preferred embodiment, the crack problem relating to the technology of the conventional example 3 does not occur. Moreover, the long grease supply lines as mentioned in the technology relating to the conventional example 4 are not necessary, so the grease lubrication can be achieved without a high pressure grease pump and it possible to simplify the grease supply system.

BRIEF DESCRIOTION OF THE DRAWING

[0023]

Fig. 1 is a side view showing a mobile crane (wheel crane) on which a telescopic boom relating to the first embodiment of the present invention is mounted;

Fig. 2 relates to the first embodiment of the present invention, Fig. 2A is a schematic plan view of the telescopic boom, Fig. 2B is a schematic side view of the telescopic boom;

Fig. 3A is a cross sectional view of Fig. 2B at the line A-A, Fig. 3B is a cross sectional view of Fig. 2B at the line B-B;

Fig. 4 relates to the first embodiment of the present invention and is a descriptive drawing of a pad mounting,

Fig. 5 relates to the second embodiment of the present invention, Fig. 5A is a schematic side view of the telescopic boom, Fig. 5B is a cross sectional view of Fig. 5A at the line C-C;

Fig. 6 is a cross sectional view of the telescopic boom relating to the conventional example 1;

Fig. 7 relates to the conventional example 2, Fig. 7A is a partial cross sectional view showing a part of the outer boom which partially accommodates the inner boom of the telescopic boom, Fig. 7B is a cross sectional view of Fig. 7A at the line D-D, Fig. 7C is an enlarged view of Fig. 7B at the area "E";

Fig. 8 relates to the conventional example 3, Fig. 8A is a lateral cross sectional view of the end portion of the four-steps telescopic boom, Fig. 8B is a cross sectional view of Fig. 8A at the line E-E; and

Fig. 9 relates to the conventional example 4 and is a longitudinal sectional view showing the layout of the grease supply line within the inner boom placed at the most retracted position.

DETAILED DESCRIPTION OF THE PREFFERED EMBODIMENTS

(First Embodiment)

[0024] In Fig. 1, a mobile crane 11 (wheel crane) is furnished with a telescopic boom Bm relating to the first embodiment mentioned after. This mobile crane 11 is furnished with a traveling frame 12. In the traveling frame 12, front wheels 12a are provided at the right side in its forwarding direction and rear wheels 12b are provided at the left side in its forwarding direction as shown in Fig. 1. On the traveling frame 12, an upper revolving body 13 is installed free to rotate around a vertical axis by a slewing ring 12c. On a front area of the upper revolving body 13, an operator cab 14 is located. On one side of the operator cab 14, the telescopic boom Bm is located so as to raise and lower by means of boom raising/lowering cylinders 15.

[0025] In the above upper revolving body 13, a winch which is not shown herein is stored. By this winch, a rope 16 is wounded or unwounded. A hook 17 for hoisting a lifting material is attached to the end of the rope 16, and is hanged down from a top of the telescopic boom Bm. Numeral 13a denotes a counterweight.

[0026] The telescopic boom Bm relating to the first embodiment of the present invention shows a four-steps telescopic boom. As shown in Fig. 2A, a base boom 1 is mounted on the upper revolving body 13 so as to be swingably raised up and lowered down. A second boom 2 is inserted free to extend and retract in the base boom 1, and a third boom 3 is inserted free to extend and retract in the second boom 2, and a top boom 4 is inserted in the third boom 3. On each base end of the top plate of the second boom 2, third boom 3 and top boom 4, upper slide pads mentioned after are installed respectively.

[0027] This telescopic boom Bm as mentioned above is the four-steps type. However, the telescopic boom of the present invention is also applicable to less than three-steps type or more than five-steps type, and is not limited only to the four-steps type of telescopic boom. The base boom 1 is an outermost boom. The second boom 2 is an inner boom of the base boom 1 as well as an outer boom of the third boom 3. Further, the third boom 3 is an outer boom of the top boom 4, and the top boom 4 is an inner boom of the third boom 3.

[0028] In Fig. 2B, an object shown in the broken lines in the lower inside area of the front end of the base boom 1 is a first front lower pad 11p which supports the second boom 2 free to slide while its telescopic motion. Next, an

object shown in the broken lines in the lower inside area of the front end of the second boom 2 is a second front lower pad 21p which supports the third boom 3 to slide while its telescopic motion. In addition, an object shown in the broken lines in the lower inside area of the front end of the third boom 3 is a third front lower pad 31p which supports the above top boom 4 free to slide while its telescopic motion.

[0029] In the first embodiment of the present invention, the upper slide pads allocated to the top plates of the base ends of the second, third and top boom 2,3,4 and the pad mountings provided on the booms are almost same respectively. Referring the top boom 4 as an example, an explanation about them is made hereafter.

[0030] A sectional configuration of the telescopic boom Bm is shown in Fig. 3A and Fig, 3B. Fig. 3A and Fig, 3B are the sectional view cut along the vertical direction against the longitudinal direction of the boom.

[0031] At the top plate of the upper half of the top boom 4 located at the innermost position of the telescopic boom, a half-square shaped box 41 is formed as mentioned after. At the right and left corners of the half-square shaped box 41 in the boom width direction, the arc-shaped portions with a predetermined radius of curvature are formed. Further, the half-square shaped box 41 is opened downwardly. On the other hand, at the bottom plate of the lower half of the top boom 4, an arch portion 42 whose outside width from the right to the left is smaller than the circumferential length of the opening is formed as be smaller than the semicircle of the arch. End portions of side plates 41b of the half-square shaped box 41 and end portions of the arch 42 are connected together with slanted flat side plates 43.

[0032] On each right and left corner in the lateral direction of the top plate of the base end of the top boom 4, pad mountings 44 are provided as mentioned after. On each one of these pad mountings 44, the upper slide pad 5 is attached as mentioned after. Moreover, the slide pads 5 and the pad mountings 44 on each right and left are symmetrical and are the same structures.

[0033] The pad mounting 44 is composed as shown in Fig. 4. The pad mounting 44 is made by cutting out the arc-shaped portion 41a formed on the top plate at the base end of the top boom 4, and has a flat pad fitting surface 44a which connects a flat top plate 41c integrally with the flat side plate 41b at the base end of the top boom 4. Furthermore, the portion where this pad mounting 44 faces the top boom 4 in the longitudinal direction is covered by a block plate 44b that has the same radius curvature as the arc-shaped portion 41a. In addition, an angle θ between the above pad fitting surface 44a and the flat top plate 41c at the base end of the top boom 4 is set smaller than 40 degrees.

[0034] The upper slide pad 5, as shown in Fig. 3B, is engaged with the pad mounting 44 so as to set the bottom surface of the upper slide pad 5 on the pad fitting surface 44a. In addition, the upper slide pad 5 is fixed on the top boom 4 with mechanical fixing means such as bolts, for example. A slide surface 5a of the upper slide pad 5 does not contact the inner surface of a flat top plate 35 of the third boom 3 in Fig. 3B. However, when the load is added to the boom, the slide surface 5a of the upper slide pad 5 is formed so that the slide pad 5 may slidably contact a part of the above inner surface 35 and the inner surface of the arc-shaped portion 31a'.

[0035] At this situation, as the angle θ between the pad fitting surface 44a and the flat top plate 41c at the base end of the top boom 4 is set to be smaller than 40 degrees, in the cross section, the contact length with a part of the inner surface of the flat top plate 35 of the third boom 3 and the inner surface 31a' of the arc-shaped portion is longer than the contact length with a part of the inner surface 41b' of the flat side plate and the inner surface 31a' of the arc-shaped portion.

[0036] A grease guide path 5b is provided so that a grease outlet port 5c opened at the flat side of the slide surface 5a of the upper slide pad 5 is connected to the inside of the arc-shaped portion 31a of the third boom 3. As shown in Fig. 2A and Fig. 3B, when the telescopic boom is held in the utmost retracted position, the grease is supplied from the grease supply port 6 provided on the top plate 11c of the base boom 1 into the grease outlet port 5c. Concentric holes in line with the grease supply port 6 are drilled on all top plates of the second boom 2, the third boom 3 and the top boom 4.

[0037] Accordingly, in the first embodiment, the slide surface 5a of the upper slide pad 5 is formed so that the slide surface 5a may slidably contact a part of the flat inner surface 35 of the third boom 3 and the inner surface of the arc-shaped portion 31a'. Moreover, the contact length with a part of the inner surface of the flat top plate 35 of the third boom 3 and the inner surface 31a' of the arc-shaped portion is longer than the contact length with a part of the inner surface 41b' of the flat side plate and the inner surface 31a' of the arc-shaped portion.

[0038] In the first embodiment, since the dimension of the upper slide pad 5 in the boom width direction can be larger, the dimension of the boom in the longitudinal direction can be smaller than that of the conventional examples 1 and 2. Because of this reason, the length L of the overhanging at the base end of the boom can be shortened and the overall length of the telescopic boom Bm in its utmost retracted position can be shortened. In other word, since the inner telescopic boom can be made longer than that of the conventional examples by the shortened amount, the overall length of the telescopic boom in its utmost extended position can be longer. In addition, since the dimension of the upper slide pad in the boom width direction can be larger, the pressure added to the pad can be decreased. Therefore, it is not necessary to increase the radius of curvature of the arc-shaped portions of each outer boom and inner boom which is inserted into the outer boom, and accordingly the telescopic boom Bm can be slenderized. Because of this reason, the first embodiment can contribute greatly to the weight reduction of the telescopic boom.

[0039] Moreover, since the pad fitting surface 44a of the pad mounting 44 is flat, the thickness of the upper slide pad 5 can be increased, and therefore the upper slide pad 5 can be reinforced.

[0040] The angle between the pad fitting surface 44a of the pad mounting 44 and the flat top plate at the base end of the top boom 4 is set to be smaller than 40 degrees. Therefore, the element of the load in the boom width direction, which is added to the upper slide pad 5, that is the force to dislocate the pad along the lateral direction, can be reduced. Therefore, the strength of mechanical fastening means which fixes the upper slide pad 5 onto the pad mounting 44 can be relatively lowered.

[0041] Furthermore, the grease supplied from the grease supply port 6 provide on the flat top plate 11c of the base boom 1 is guided into the arc-shaped portion of the third boom 3 through the grease guide path 5b located on the upper slide pad 5. Because the arc-shaped portions on the boom do not have any grease holes, any such problems as the crack occurrence on the boom do not occur at all. In addition, because such grease supply pipe as used in the conventional example 4 is not used, grease lubrication is fulfilled without any assistance of a high pressure grease pump, and therefore the grease supply system is simplified.

(Second Embodiment)

[0042] Hereinafter, referring to Fig. 5A and Fig. 5B, a telescopic boom relating to the second embodiment of the present invention is explained hereinafter. Since the difference between the second embodiment and the first embodiment exists only in the points of the location of the grease holes and the configuration of the grease guide path. As other parts except for these points are identical to those of the above mentioned first embodiment, these differences are explained mainly hereinafter.

[0043] A grease inlet port 7c has a path opened toward the lateral side of the third boom 3 from the slide surface 7a of an upper slide pad 7. Further, the grease guide path 7b is connected continuously to the inner surface of the arc-shaped portion of the top boom 4. As shown in Fig. 5B, when the above telescopic boom Bm is in the utmost retracted position, the grease is supplied from a grease supply port 8 provided at a lateral side plate 11b of the base boom 1 into the grease inlet port 7c. Moreover, concentric holes in line with the grease supply port 8 are drilled on all lateral plates of the second boom 2, third boom 3 and the top boom 4.

[0044] In the telescopic boom Bm relating to the second embodiment, the grease supplied from the grease supply port 8 provided on the lateral slide plate 11b of the base boom 1 is guided into an inner surface 31a' of the arc-shaped portion of the third boom 3 through the grease guide path 7b provided in the upper slide pad 7. This structure is only the difference from the telescopic boom Bm relating to the above first embodiment, and other structures are the same as those of the telescopic boom Bm relating to the first embodiment.

[0045] Furthermore, in the above mentioned embodiments, the explanation is directed to the upper slide pads provided on the top booms as an example. However, the same structure is applicable to the upper slide pads of any other inserted booms except for the base boom. In addition, although the above mentioned embodiments are used for a wheel crane as an example, it should be noted that the present invention is not limited to the embodiments described above. The present invention can be applicable, for example, to other type of crane having a telescopic boom, and to a telescopic boom for a work platform vehicle and so forth.

[0046] An upper slide pad 5 is provided on a base end of a flat top plate 41c of an inner boom 4 inserted into an outer boom 3 of a telescopic boom Bm. A slide surface 5a of the upper slide pad 5 is formed so that a contact length with an inner surface 35 of a flat top plate of the outer boom 3 and an inner surface 31a' of a arc-shaped portion is longer than a contact length with an inner surface of a flat lateral side plate of the outer boom 3 and the inner surface 31a' of the arc-shaped portion. Accordingly, the present invention can procure a lighter and stronger telescopic boom whose overall length can be longer in its utmost extended position. Moreover, the present invention can also shorten the overall length of the telescopic boom in its utmost retracted position, and can increase strength of the arc-shaped portion of the telescopic boom.

Claims

1. A telescopic boom, comprising:

an outer boom (1, 2, 3),
at least one inner boom (2, 3, 4) which is inserted into said outer boom (1, 2, 3),
an arc-shaped surface (41a) which is formed at a corner of said inner boom (4),
a flat top plate (41c) and a flat lateral side plate (41b) which are connected integrally with said arc-shaped surface (41a) of said inner boom (4), and
an upper slide pad (5) which is installed on a pad mounting (44) located at a base end portion of a top plate of said inner boom (4), said upper slide pad (5) facing said outer boom (3),
characterized in that
a slide surface (5a) of said upper slide pad (5) is formed so that a contact length with an inner surface (35) of said flat top plate of said outer boom (3) and an inner surface (31a') of said arc-shaped portion is longer, at a cross section of said outer boom (3), than a contact length with an inner surface of said flat lateral side plate of said outer boom (3) and said inner surface (31a') of said arc-shaped portion.

2. The telescopic boom according to claim 1, wherein a pad fitting surface (44a) of said pad mounting (44) is formed by cutting out said arc-shaped portion (41a) and is formed as a slanted surface which is connected with said flat top plate (41c) and said flat lateral plate (41b).

3. The telescopic boom according to claim 2, wherein an angle between said pad fitting surface (44a) and said flat top plate (41c) is smaller than 40 degrees.

4. The telescopic boom according to any of claims 1 to 3, further comprising,

a grease supply port (6) provided on either said flat top plate or said flat lateral plate of said outer boom (1, 2, 3), and
a grease guide path (5b) which is provided on said upper slide pad (5), so that said guide path (5b) guides grease supplied from said grease supply port (6) into said inner surface (31a') of said arc-shaped portion of said outer boom (1, 2, 3).

FIG. 1

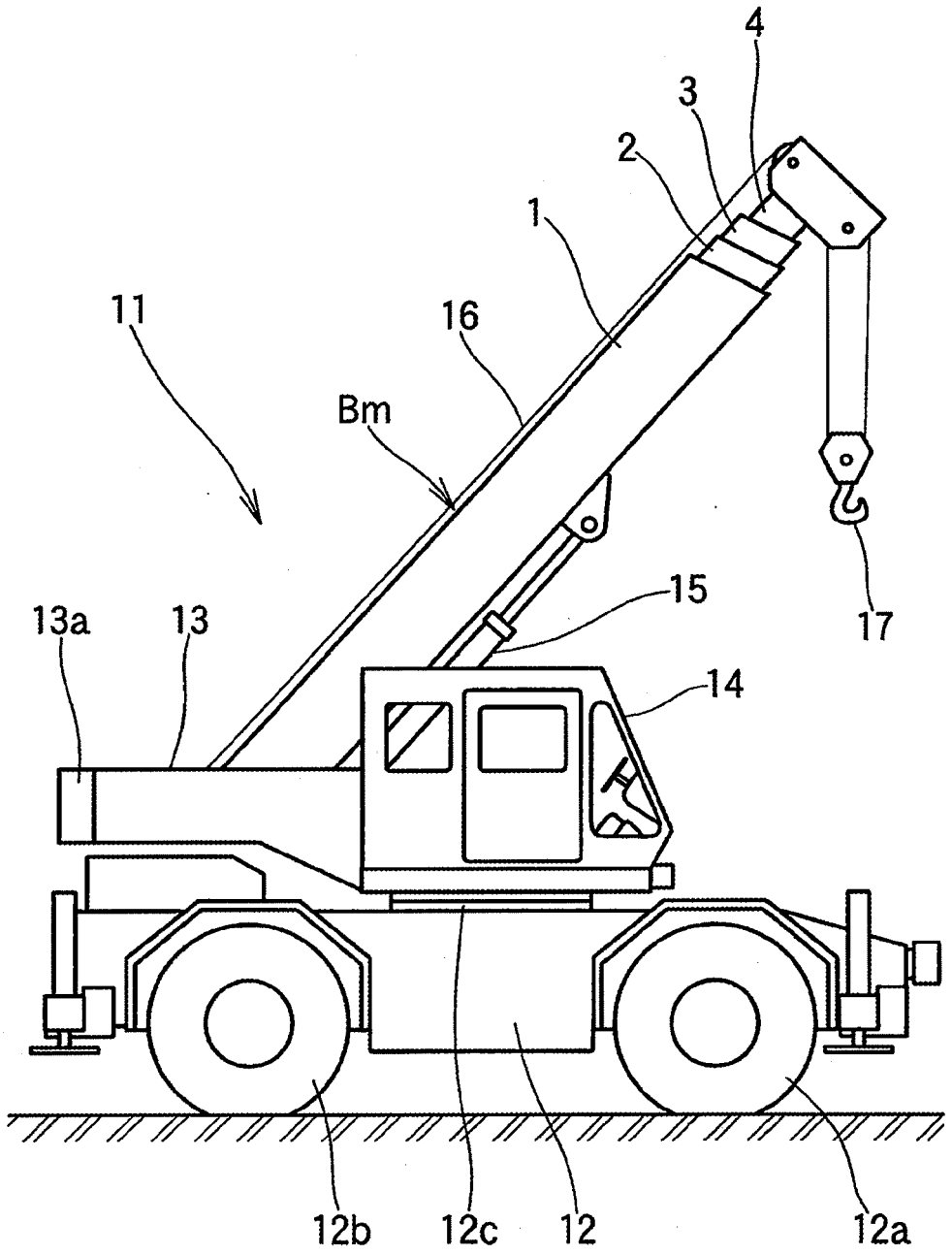
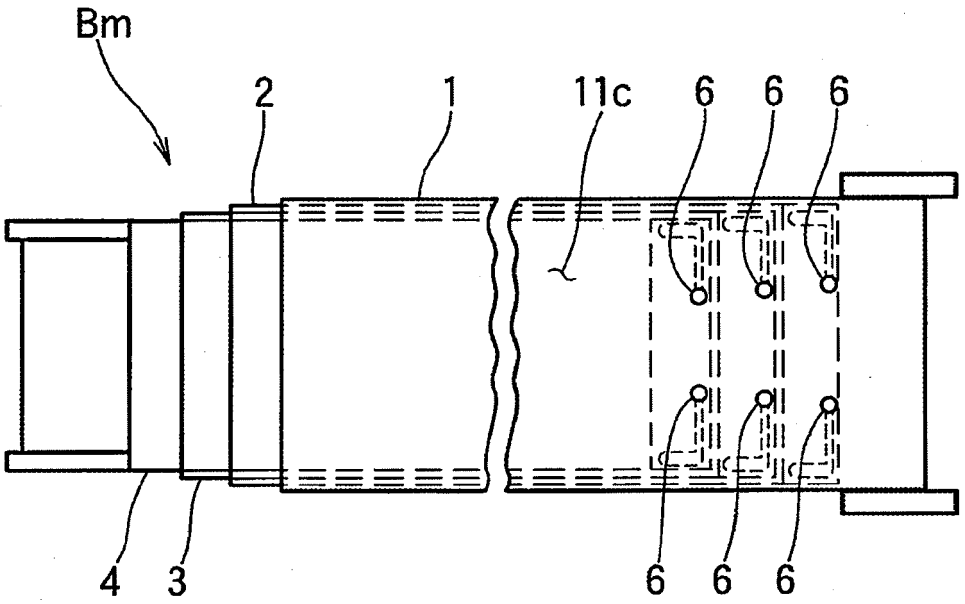


FIG. 2

(a)



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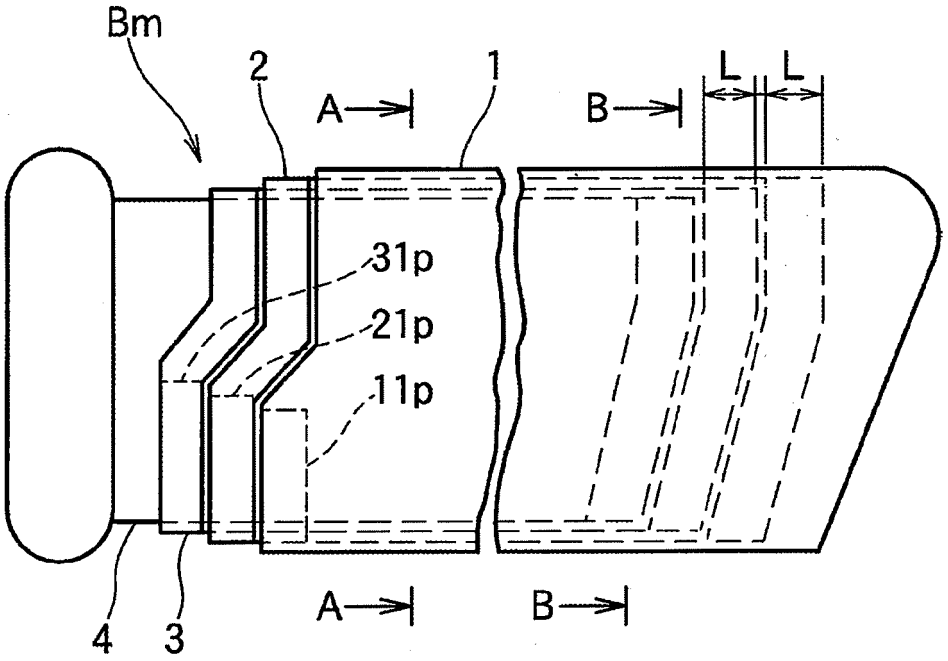
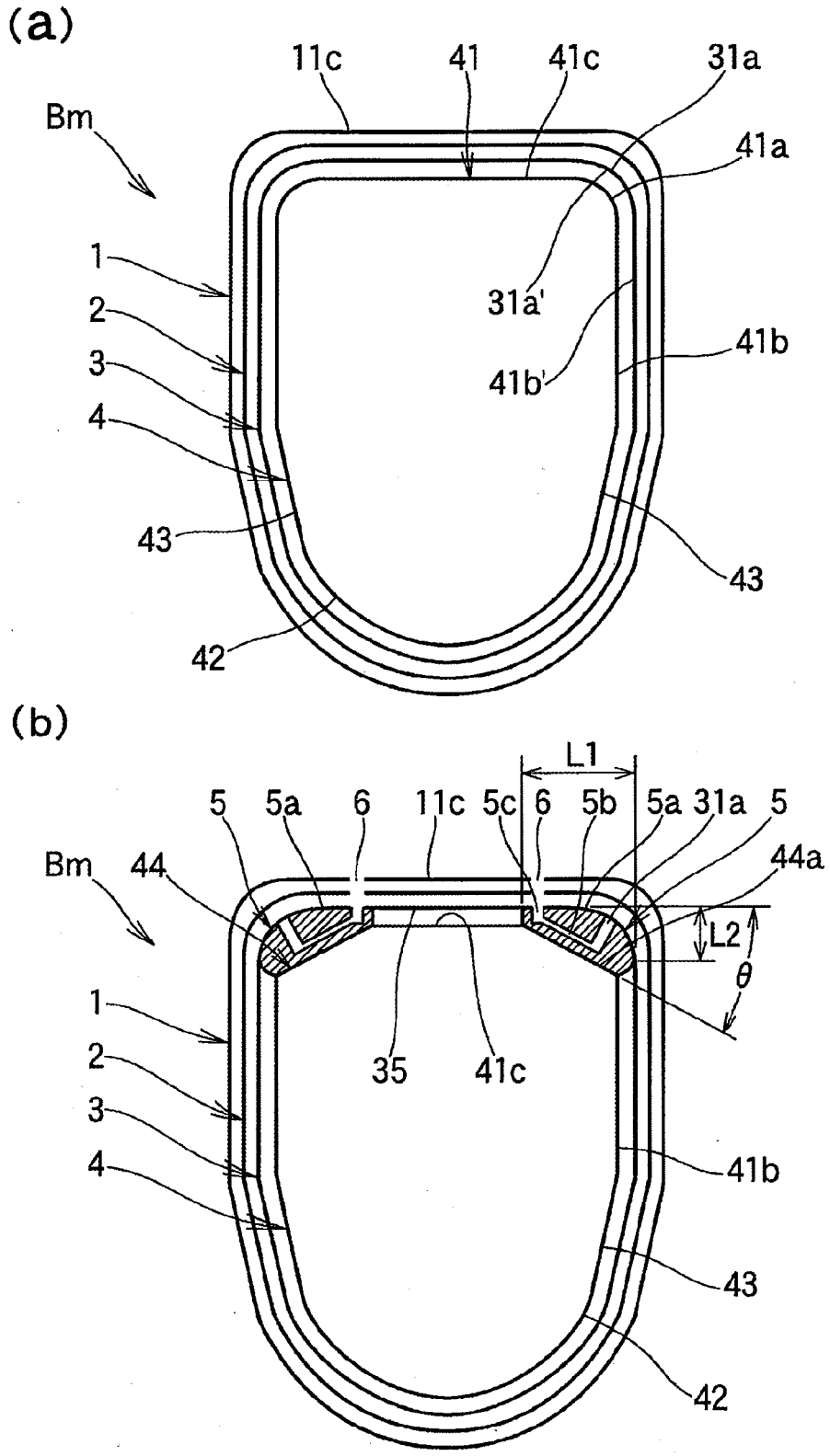


FIG. 3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41
41c
31a
Bm
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3
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31a'
41b
41b'
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5c
6
5b
5a
31a
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Bm
44
44a
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3
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35
41c
41b
43
42

FIG. 4

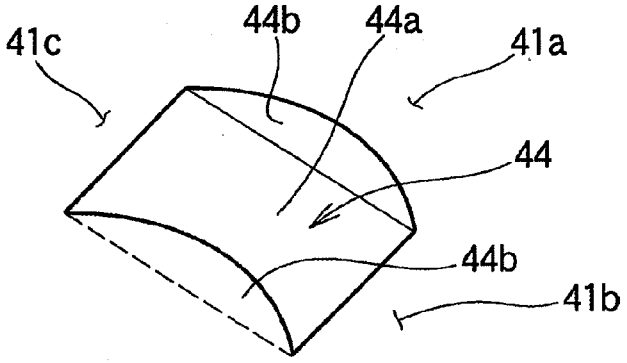

41c
44b
44a
41a
44
44b
41b

FIG. 5

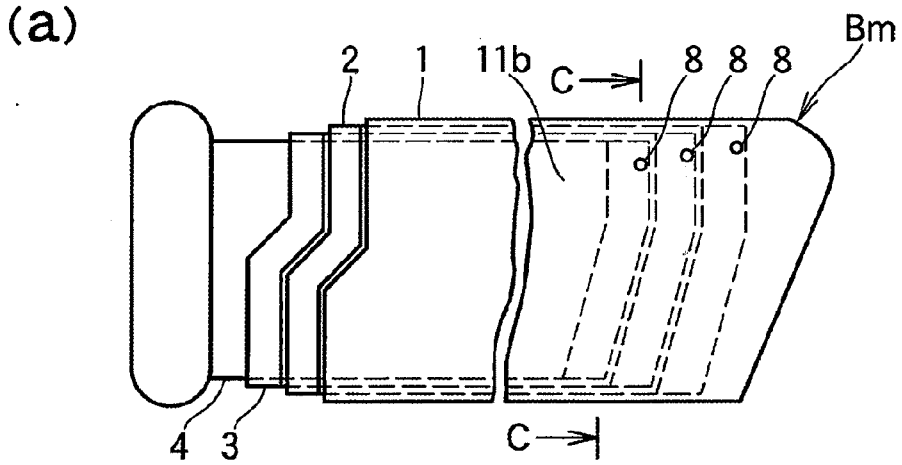

(a)
2
1
11b
C
8
8
8
Bm
4
3
C
(b)
44
7a
11a
44
7b
8
8
7c
1
31a'
35
7
2
11b
Bm
3
4

FIG. 6

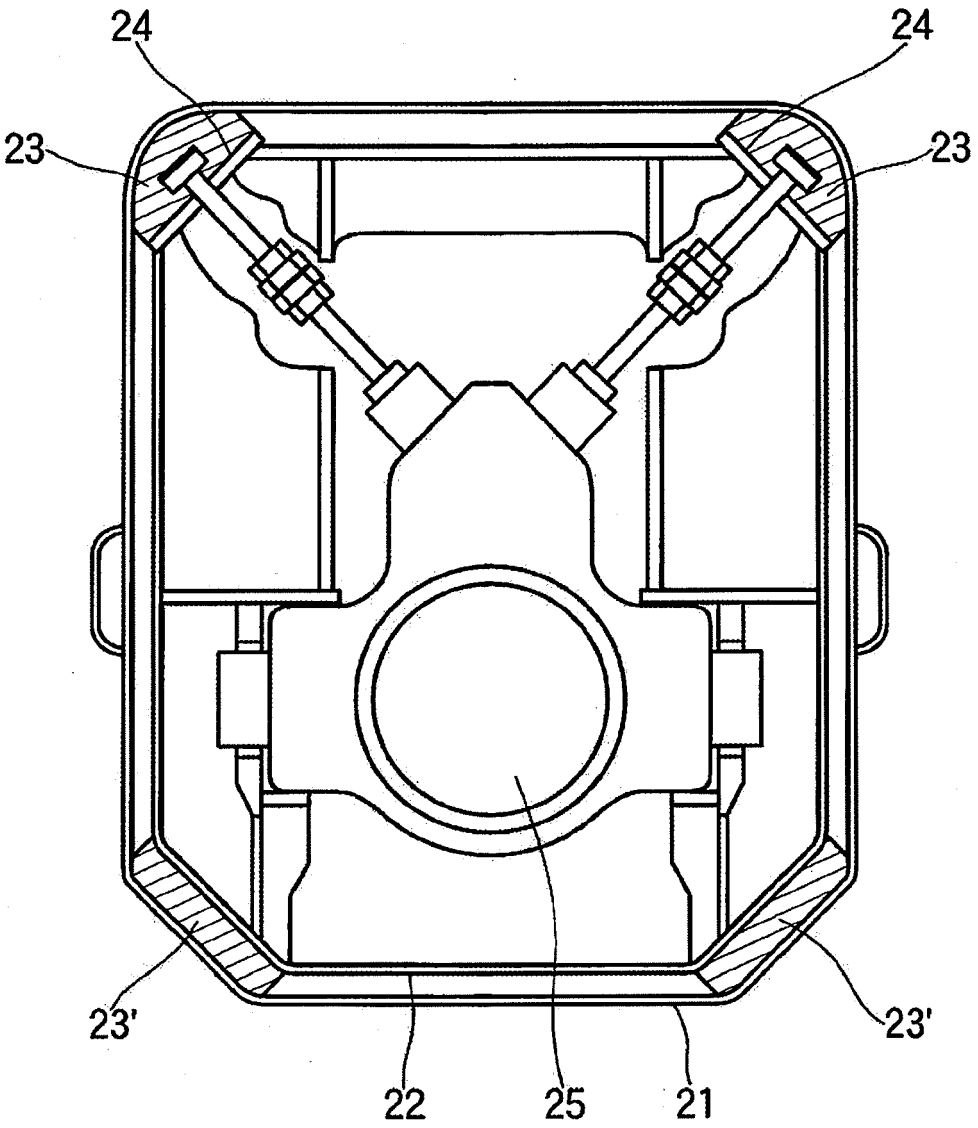


FIG. 7

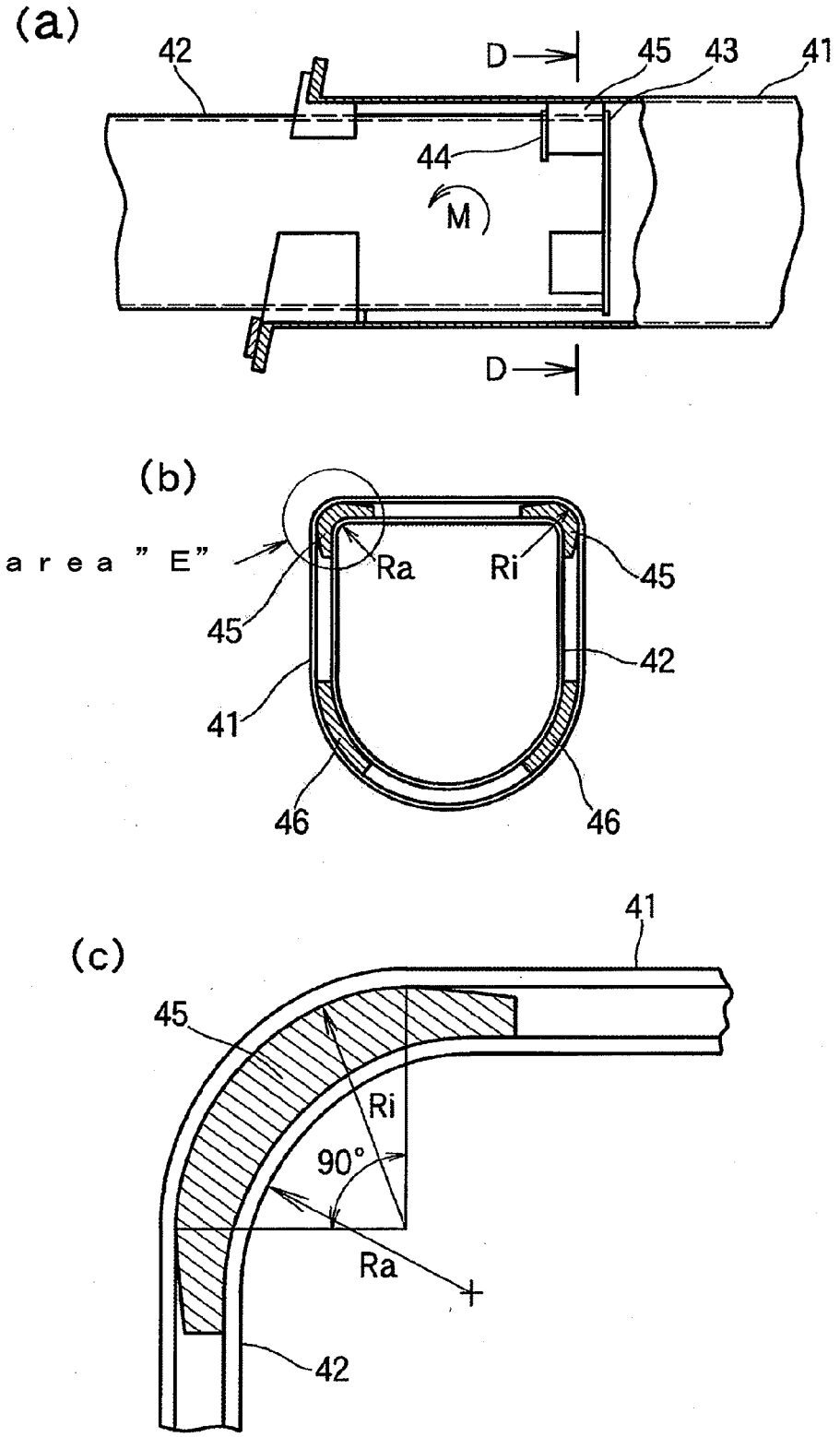


FIG. 8

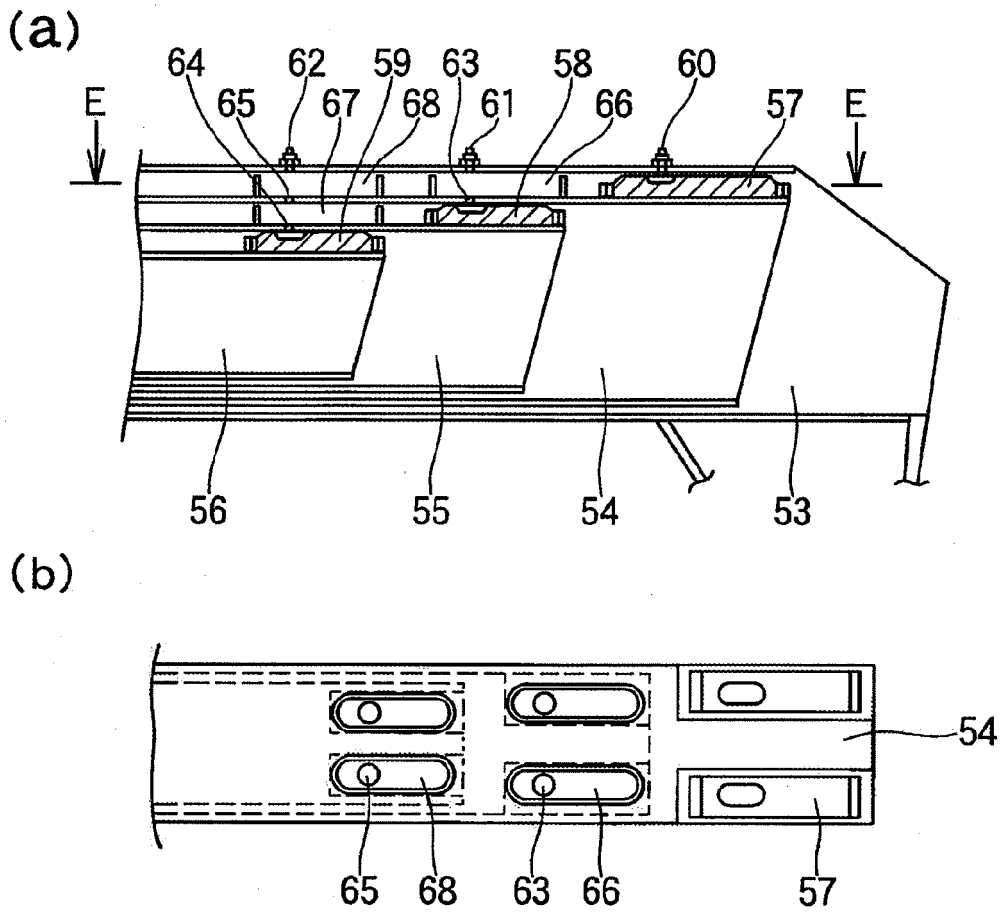
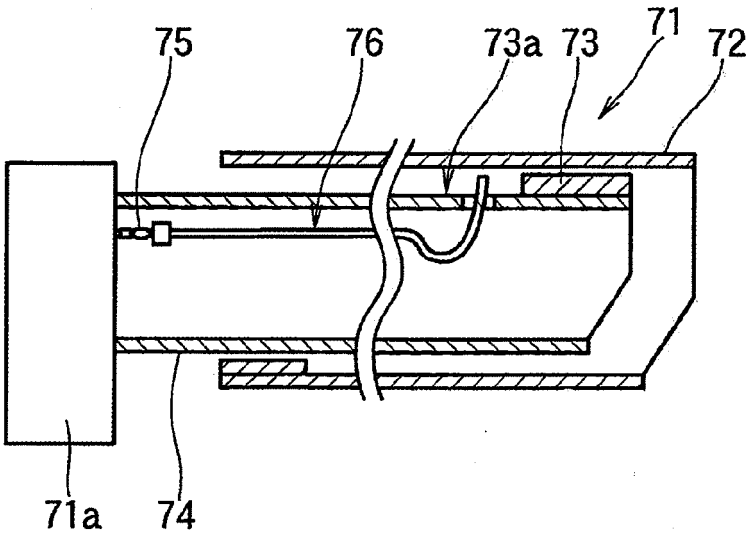

(a)
64
62
59
63
58
60
E
65
67
68
61
66
57
E
56
55
54
53
(b)
54
65
68
63
66
57

FIG. 9


75
76
73a
73
71
72
71a
74

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EUROPEAN SEARCH REPORT

Application Number
EP 09 17 5135

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B66C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	15 February 2010	Sheppard, Bruce

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