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(54) **BOOM OF CONCRETE PUMP TRUCK AND CONCRETE PUMP TRUCK**

(57) The present invention provides a boom of concrete pump truck, which has folded state and unfolded state, the boom comprises seven boom sections articulated in sequence, in the folded state, the seven boom sections are essentially arranged in five straight lines staggered to each other, and at least the last two boom sections are in the same straight line. Since the seven sections are essentially arranged in five straight lines staggered from each other, the overall dimensions of the

boom sections can be reduced greatly, and the requirement for road conditions can be met easily. Moreover, in the folded state, at least the last two boom sections are in the same straight line; therefore, the flexibility and operability of the boom for material distribution can be greatly improved. The present invention further provides a concrete pump truck that comprises the boom described above.

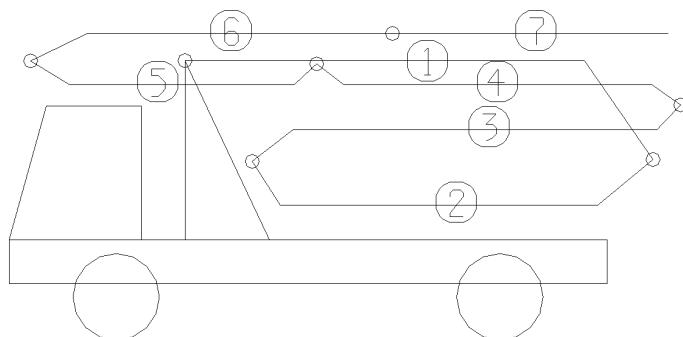


Fig. 1(b)

Description**Technical Field**

[0001] The present invention relates to a transportation equipment of concrete or other building materials, in particular to a boom of concrete pump truck and a concrete pump truck with the boom.

Background of the Invention

[0002] A concrete transportation pump truck (abbreviated as "concrete pump truck" or "pump truck") is a concrete transportation apparatus which a concrete pump and an articulated boom are mounted on an automobile chassis, a concrete delivery pipe is laid along the boom, and concrete is outputted through a terminal hose ultimately. The articulated boom has folded state and unfolded state. In the folded state, the boom is folded onto the chassis, so that the pump truck can run on the road. In the unfolded state, the boom is unfolded, so that concrete can be poured over a long distance.

[0003] It is well-known that the folded forms of the boom mainly include R-shaped, Z-shaped, and RZ-shaped folded forms. The R-shaped folded form refers to that the boom sections can be folded in a coiled or rolled up manner in a first direction (e.g., clockwise direction), and can be unfolded in a second direction being reversed to the first direction (e.g., counter-clockwise direction). The Z-shaped folded form refers to that the boom sections can be folded or unfolded in reversed direction in turns. The RZ-shaped folded form is a combination of R-shaped and Z-shaped folded forms. More boom sections are required in order to obtain a longer concrete transportation distance. However, the pump truck is inevitably subjected to restrictions of the road conditions when it runs on the road, for example, when the boom is in the folded state, the length, width, and height of the pump truck are subjected to restrictions of the road transportation rules. Therefore, it is impossible to increase boom sections freely. At present, the number of the boom sections on a concrete pump truck is usually not more than 6.

[0004] In order to increase the concrete transportation distance, it is necessary to increase the length of each boom section if the number of sections is unchanged. However, in this case, the flexibility and operability of the boom will be degraded, and on the other hand, the sectional dimensions of the boom sections have to be increased accordingly since the length of the boom sections have been increased; consequently, the overall size of the pump truck is increased to some degree, and the pump truck will be restricted by road conditions.

[0005] For long, it has been a challenge in the art to ensure the pump truck meeting the road transportation rules as the boom is in the folded state, and to increase the concrete transportation distance as far as possible as the boom is in the unfolded state, while to improve the

flexibility and operability of the boom.

Summary of the Invention

[0006] The object of the present invention is to provide a boom of concrete pump truck, which can extend the concrete delivery range as far as possible when it is in unfolded state and has high flexibility and operability, but essentially doesn't increase the overall dimensions of the pump truck when it is in folded state.

[0007] To attain the object described above, the present invention provides a boom of concrete pump truck, which has a folded state and a unfolded state, and comprises seven boom sections articulated in sequence, wherein, in the folded state, the seven boom sections are essentially arranged in five straight lines staggered to each other, and at least the last two boom sections are in the same straight line.

[0008] Preferably, in the folded state, the fourth boom section to the seventh boom section are in two straight lines among the five straight lines.

[0009] Preferably, the fourth boom section and the fifth boom section are in one of the two straight lines, and the sixth boom section and seventh boom section are in the other one of the two straight lines.

[0010] Preferably, in the folded state, the first boom section and the second boom section are in a first longitudinal plane, the fourth boom section to the seventh boom section are in a second longitudinal plane, the first longitudinal plane and the second longitudinal plane are parallel to each other and spaced from each other, and the third boom section extends between the first longitudinal plane and the second longitudinal plane.

[0011] Preferably, when the boom is folded, the first boom section to the third boom section are folded in a first direction, the fourth boom section is folded onto the third boom section in a second direction that is reversed to the first direction, and the sixth boom section is folded onto the fifth boom section in the first direction.

[0012] Preferably, the fifth boom section, the sixth boom section and the seventh boom section are in one of the two straight lines, while the fourth boom section is in the other one of the two straight lines separately.

[0013] Preferably, in the folded state, the first boom section and the second boom section are in a first longitudinal plane, the fourth boom section to the seventh section are in a second longitudinal plane, the first longitudinal plane and the second longitudinal plane are parallel to each other and spaced from each other, and the third boom section extends between the first longitudinal plane and the second longitudinal plane.

[0014] Preferably, when the boom is folded, the first boom section to the third boom section are folded in a first direction, the fourth boom section is folded onto the third boom section in a second direction that is reversed to the first direction, and the fifth boom section is folded onto the fourth boom section in the first direction.

[0015] Preferably, in the folded state, the five straight

lines are essentially parallel to each other.

[0016] In addition, the present invention further provides a concrete pump truck, which comprises an automobile chassis, a revolving platform, and a boom, with the boom mounted on the automobile chassis via the revolving platform, wherein, the boom is the boom provided in the present invention.

[0017] With the technical scheme described above, a boom that has seven boom sections can be provided, and therefore the concrete delivery range can be extended to some degree. In addition, in folded state, the seven boom sections are essentially arranged in five straight lines staggered from each other; therefore, the overall dimensions of the sections can be decreased greatly, and the requirement for road conditions can be met easily. Moreover, in folded state, at least the last two boom sections are in the same straight line; therefore, the flexibility and operability of the boom for material distribution can be greatly improved.

[0018] Other characteristics and advantages of the present invention will be further detailed in the embodiments hereunder.

Brief Description of the Drawings

[0019] The accompanying drawings are provided here to facilitate further understanding on the present invention, and are a part of this document. They are used together with the following embodiments to explain the present invention, but shall not be comprehended as constituting any limitation to the present invention. Among the drawings:

Figure 1(a) is a side view of the concrete pump truck according to an embodiment of the present invention.

Figure 1(b) is a schematic diagram of the concrete pump truck shown in Figure 1(a).

Figure 2(a) is a side view of the concrete pump truck according to another embodiment of the present invention.

Figure 2(b) is a schematic diagram of the concrete pump truck shown in Figure 2(a).

Figure 3 ~ Figure 10 are schematic diagrams of the concrete pump trucks according to other embodiments of the present invention.

Detailed Description of the Embodiments

[0020] Hereafter the embodiments of the present invention will be detailed, with reference to the accompanying drawings. It should be appreciated that the embodiments described here are only provided to describe and explain the present invention, but shall not be deemed

as constituting any limitation to the present invention.

[0021] As shown in the figures, the concrete pump truck mainly comprises an automobile chassis, a revolving platform, and a boom, wherein, the boom is mounted on the automobile chassis via the revolving platform 8, so that the boom can revolve around the revolving platform 8 as required, and preferably can revolve 0°-360°.

[0022] The concrete pump truck provided in the present invention has seven boom sections articulated in sequence, i.e., there are the first boom section to the seventh boom section when counted from the first boom section 1 connected to the revolving platform 8. Compared to the boom having five boom sections in the prior art, the boom having seven boom sections in the present invention can increase the concrete transportation distance to some degree.

[0023] In addition, as an importance aspect of the present invention, when the boom is in a folded state, the seven boom sections are essentially arranged in five straight lines staggered from each other; in other words, the seven boom sections form a "five-layer" structure when they are folded, rather than a "seven-layer" structure in the conventional meaning (no matter the structure is a R-shaped structure or Z-shaped structure); therefore, the overall dimensions of the boom sections, especially the height of the pump truck, can be reduced greatly, and the requirement for road conditions can be met easily.

[0024] Moreover, as another important aspect of the present invention, when the boom is in the folded state, at least the last two boom sections are in a same straight line; therefore, the flexibility and operability of the boom for material distribution can be greatly improved. The seven boom sections can be folded into a "five-layer" structure just because several sections are in the same straight line. When this feature is combined with the features described above, a novel technical scheme (i.e., a novel boom) will be formed, which has greater progressive significance and higher market value than conventional booms.

[0025] In the above technical scheme, those skilled in the art can implement the present invention in a variety of ways. For example, three boom sections can be arranged in a same straight line, so that the seven boom sections can be arranged in five straight lines; or, four boom sections can be arranged in pairs in two straight lines respectively, so that the seven boom sections can be arranged in five straight lines. Theoretically, the two or three boom sections arranged in the same straight line can be any adjacent sections among the seven boom sections. However, as a preferred embodiment, the fourth boom section to the seventh boom section (i.e., the last four boom sections) are arranged in two straight lines. Usually a terminal hose is connected to the last boom section to transfer concrete to a specified working place during the work. Therefore, the flexibility and operability of the boom for material distribution can be improved greatly by arranging the last several sections in straight lines.

[0026] Hereafter two preferred embodiments of the present invention will be detailed first, with reference to the accompanying drawings.

[0027] Figure 1(a) and 1(b) show an embodiment of the present invention. As shown in the figures, among the seven boom sections of the boom, the fourth boom section 4 and the fifth boom section 5 are in the same straight line, and the sixth boom section 6 and the seventh boom section 7 are in the same straight line. The two straight lines are the last two straight lines among the five straight lines of the boom in the present invention. In this way, the last four boom sections are arranged in two adjacent straight lines, so that the overall dimensions of the pump truck can be reduced, and the flexibility and operability of the boom for material distribution can be greatly improved.

[0028] In addition, it can be seen from Figure 1(a), when the boom is in the folded state, the first boom section 1 and the second boom section 2 are in a first longitudinal plane, the fourth boom section 4 to the seventh boom section 7 are in a second longitudinal plane, the first longitudinal plane and the second longitudinal plane are parallel to each other and spaced from each other, and the third boom section 3 extends between the first longitudinal plane and the second longitudinal plane. That is to say, in the width direction of the pump truck, the first longitudinal plane comprising the first boom section 1 and the second boom section 2 and the second longitudinal plane comprising the fourth section 4 to the seventh boom section 7 are spaced from each other, and connected to each other via the third boom section 3, i.e., the third boom section 3 is designed into a curved shape, so that one end of the third boom section 3 is positioned in the first longitudinal plane and the other end of the third boom section 3 is positioned in the second longitudinal plane. Through this arrangement, the height of the pump truck can be reduced, and the space in width direction above the chassis of the pump truck can be fully utilized.

[0029] In addition, as a preferred boom folded pattern, as shown in the figures, when the boom is folded, the first boom section 1 to the third section 3 are folded in a first direction (clockwise direction as shown in Figure 1(b)), the fourth boom section 4 is folded onto the third boom section 3 in a second direction (counter clockwise direction) being reversed to the first direction, and the sixth boom section 6 is folded onto the fifth boom section 5 in the first direction. The boom can be unfolded in the reversed direction. Through the combined folded pattern, the space occupied by the boom in the folded state can be reduced effectively; therefore, the overall dimensions of the pump truck in travel state can be reduced, and the requirement for road conditions can be met easily.

[0030] Figure 2(a) and 2(b) show the second embodiment of the present invention. As shown in the figures, among the seven boom sections of the boom, the fifth boom section 5, the sixth boom section 6, and the seventh boom section 7 are in the same straight line, and the

fourth boom section 4 is in the other adjacent straight line separately. Through this way, the last three boom sections are arranged in the same straight line, so that the flexibility and operability of the boom can be improved; in addition, in some cases that the space is limited, the concrete can also be transported to a specified working place successfully.

[0031] Moreover, similar to the first embodiment, the seven boom sections can be arranged in two longitudinal planes in this embodiment, so as to reduce the height of the pump truck and fully utilize the space in width direction above the chassis of the pump truck. It will not be described repeatedly herein.

[0032] In addition, as a preferred boom folded pattern, as shown in the figures, when the boom is folded, the first boom section 1 to the third section 3 are folded in a first direction (clockwise direction as shown in Figure 2(b)), the fourth boom section 4 is folded onto the third section 3 in a second direction (counter clockwise direction as shown in Figure 2(b)) being reversed to the first direction, and the fifth boom section 5 is folded onto the fourth boom section 4 in the first direction. Through the combined folded pattern, the space occupied by the boom in the folded state can also be reduced effectively; therefore, the overall dimensions of the pump truck in travel state can be reduced, and the requirement for road conditions can be met easily.

[0033] Moreover, as an embodiment of the present invention, as shown in Figure 1(a) and Figure 2(a), the five straight lines formed by the seven boom sections are essentially parallel to each other. That is to say, when the boom sections are in the folded state, all of them are essentially level; therefore, the structure is stable and easy to arrange relatively.

[0034] In another aspect of the present invention, provides a concrete pump truck mainly comprising an automobile chassis, a revolving platform, and a boom, wherein, the boom is mounted on the automobile chassis via the revolving platform 8, and the boom is the boom provided in the present invention.

[0035] Besides the above two embodiments, the present invention further provides some other embodiments of the boom that comprises seven boom sections, as shown in Figures 3-10. Hereafter these embodiments will be described.

[0036] As shown in Figure 3, in the folded state, the sixth boom section 6 and the seventh boom section 7 are arranged in a straight line; therefore, the flexibility and operability of the boom can be improved. In addition, when the boom is folded, the first boom section 1 to the third section 3 are folded in an R-shaped pattern in clockwise direction as shown in Figure 3, while the third boom section 3 to the sixth boom section 6 are folded in a Z-shaped pattern.

[0037] As shown in Figure 4, in the folded state, the sixth boom section 6 and the seventh boom section 7 are arranged in a straight line. In addition, when the boom is folded, the first boom section 1 to the third section 3 are

folded in a Z-shaped pattern, while the third boom section 3 to the sixth boom section 6 are folded in a reversed Z-shaped pattern, i.e., the folded direction of the third boom section 3 to the sixth boom section 6 is reversed to the folded direction of the first boom section 1 to the third boom section 3.

[0038] As shown in Figure 5, when the boom is folded, the first boom section 1 to the third section 3 are folded in a Z-shaped pattern, while the third boom section 3 to the seventh boom section 7 are folded in a reversed Z-shaped pattern, i.e., the folded direction of the third boom section 3 to the seventh boom section 7 is reversed to the folded direction of the first boom section 1 to the third boom section 3.

[0039] As shown in Figure 6, in the folded state, the sixth boom section 6 and the seventh boom section 7 are arranged in a straight line. In addition, when the boom is folded, the first boom section 1 to the third boom section 3 are folded in a R-shaped pattern in clockwise direction as shown in Figure 6, while the third boom section 3 to the fifth boom section 5 are folded in a reversed R-shaped pattern, i.e., folded in counter clockwise direction, and the sixth boom section 6 is folded to the bottom of the fifth boom section 5 in clockwise direction. Moreover, in this embodiment, the fifth boom section 5, the sixth boom section 6, and the seventh boom section 7 are arranged in an inclined manner on the pump truck (higher at the front end and lower at the rear end in the front-rear direction of the pump truck), so as to improve the space utilization above the chassis and reduce the overall dimensions of the pump truck.

[0040] As shown in Figure 7, in the folded state, the sixth boom section 6 and the seventh boom section 7 are arranged in a straight line. In addition, when the boom is folded, the first boom section 1 to the third boom section 3 are folded in a Z-shaped pattern, while the second boom section 2 to the sixth boom section 6 are folded in an R-shaped pattern in counter clockwise direction as shown in Figure 7. Moreover, in this embodiment, the fifth boom section 5 is arranged in an inclined manner on the pump truck (lower at the front end and higher at the rear end in the front-rear direction of the pump truck).

[0041] As shown in Figure 8, when the boom is folded, the first boom section 1 to the third boom section 3 are folded in a R-shaped pattern in clockwise direction as shown in Figure 8, while the third boom section 3 to the fifth boom section 5 are folded in a reversed R-shaped pattern, i.e., folded in counter clockwise direction, and the fifth boom section 5 to the seventh boom section 7 are folded in a R-shaped pattern in clockwise direction.

[0042] As shown in Figure 9, in the folded state, the sixth boom section 6 and the seventh boom section 7 are arranged in a straight line. In addition, when the boom is folded, the first boom section 1 to the third boom section 3 are folded in a R-shaped pattern in clockwise direction as shown in Figure 9, while the boom sections 2-5 are folded in a Z-shaped pattern, and the sixth boom section 6 is folded to the bottom of the fifth boom section 5 in

clockwise direction.

[0043] As shown in Figure 10, in the folded state, the sixth boom section 6 and the seventh boom section 7 are arranged in a straight line. In addition, when the boom is folded, the first boom section 1 to the third boom section 3 are folded in a Z-shaped pattern, while the third boom section 3 to the fifth boom section 5 are folded in a reversed Z-shaped pattern, and the sixth boom section 6 is folded to the bottom of the fifth boom section 5 in clockwise direction.

[0044] While some preferred embodiments of the present invention are described above with reference to the accompanying drawings, the present invention is not limited to the details in those embodiments. Those skilled in the art can make modifications and variations to the technical scheme of the present invention, without departing from the spirit of the present invention. However, all these modifications and variations shall be deemed as falling into the protected domain of the present invention.

[0045] In addition, it should be appreciated that the technical features described in the above embodiments can be combined in any appropriate manner, provided that there is no conflict among the technical features in the combination. To avoid unnecessary iteration, such possible combinations will not be described here in the present invention.

[0046] Moreover, the different embodiments of the present invention can be combined freely as required, as long as the combinations don't deviate from the ideal and spirit of the present invention. However, such combinations shall also be deemed as falling into the scope disclosed in the present invention.

Claims

1. A boom of concrete pump truck, which has a folded state and unfolded state, wherein, the boom comprises seven boom sections articulated in sequence, in the folded state, the seven boom sections are essentially arranged in five straight lines staggered to each other, and at least the last two boom sections are in the same straight line.
2. The boom of concrete pump truck according to claim 1, wherein, in the folded state, the fourth boom section to the seventh boom section are in two straight lines among the five straight lines.
3. The boom of concrete pump truck according to claim 2, wherein, the fourth boom section and the fifth boom section are in one of the two straight lines, while the sixth boom section and the seventh boom section are in the other one of the two straight lines.
4. The boom of concrete pump truck according to claim 3, wherein, in the folded state, the first boom section

and the second boom section are in a first longitudinal plane, the fourth boom section to the seventh boom section are in a second longitudinal plane, the first longitudinal plane and the second longitudinal plane are parallel to each other and spaced from each other, and the third boom section extends between the first longitudinal plane and the second longitudinal plane. 5

5. The boom of concrete pump truck according to claim 4, wherein, when the boom is folded, the first boom section to the third boom section are folded in a first direction, the fourth boom section is folded onto the third boom section in a second direction that is reversed to the first direction, and the sixth boom section is folded onto the fifth boom section in the first direction. 10
6. The boom of concrete pump truck according to claim 2, wherein, the fifth boom section, the sixth boom section and the seventh boom section are in one of the two straight lines, while the fourth boom section is in the other one of the two straight lines separately. 20
7. The boom of concrete pump truck according to claim 6, wherein, in the folded state, the first boom section and the second boom section are in a first longitudinal plane, the fourth boom section to the seventh boom section are in a second longitudinal plane, the first longitudinal plane and the second longitudinal plane are parallel to each other and spaced from each other, and the third boom section extends between the first longitudinal plane and the second longitudinal plane. 25 30 35
8. The boom of concrete pump truck according to claim 7, wherein, when the boom is folded, the first boom section to the third section are folded in a first direction, the fourth boom section is folded onto the third boom section in a second direction that is reversed to the first boom direction, and the fifth boom section is folded onto the fourth boom section in the first direction. 40
9. The boom of concrete pump truck according to claim 1, wherein, in the folded state, the five straight lines are essentially parallel to each other. 45
10. A concrete pump truck, comprising an automobile chassis, a revolving platform, and a boom, the boom is mounted on the automobile chassis via the revolving platform, wherein, the boom is the boom described in any one of claims 1-9. 50

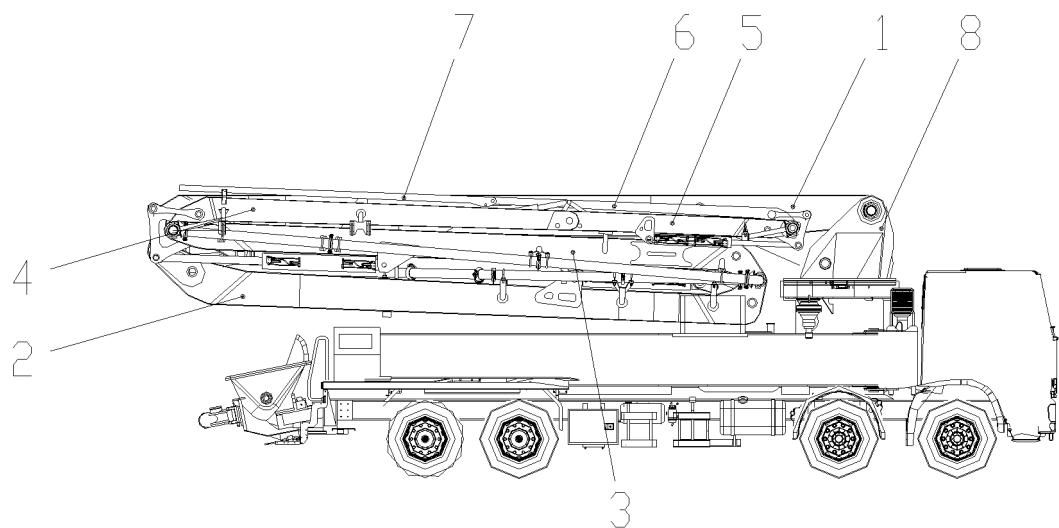


Fig. 1(a)

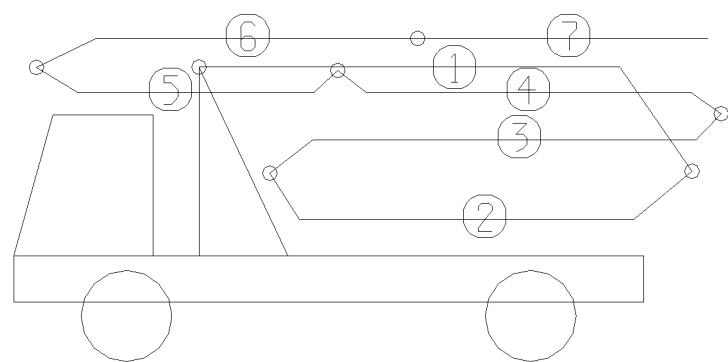


Fig. 1(b)

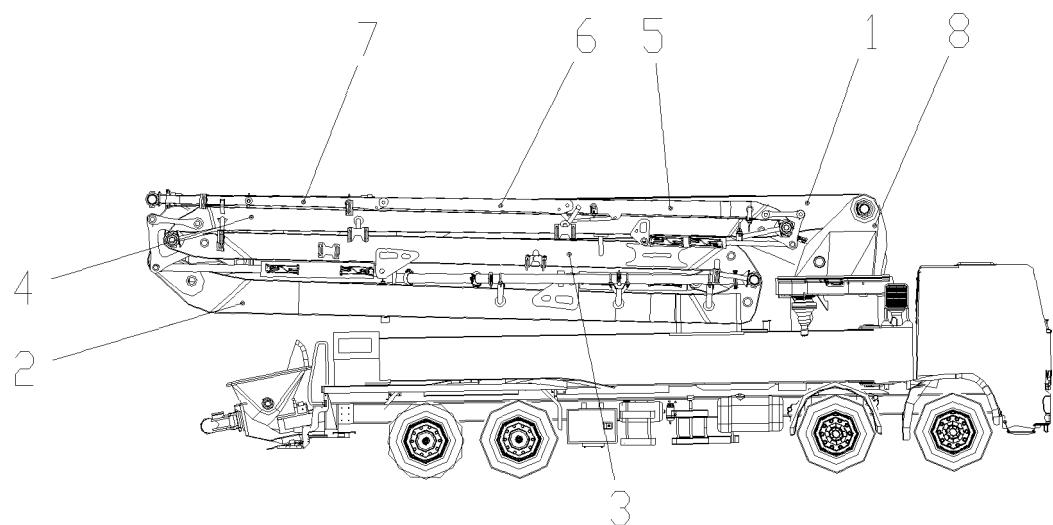


Fig. 2(a)

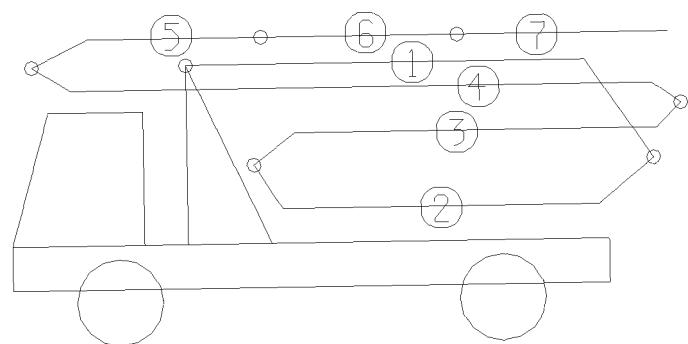


Fig. 2(b)

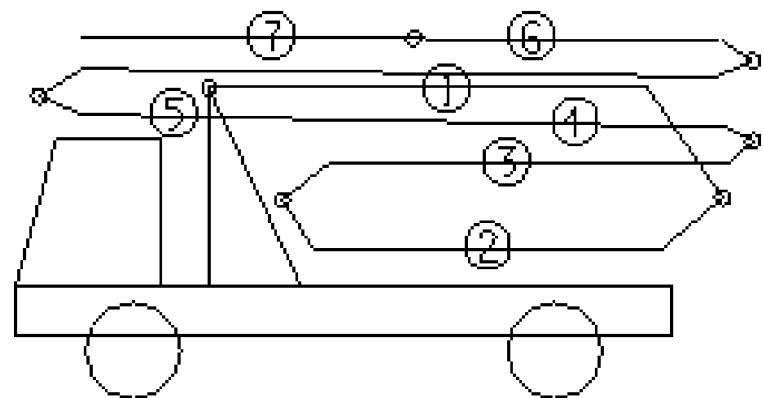


Fig. 3

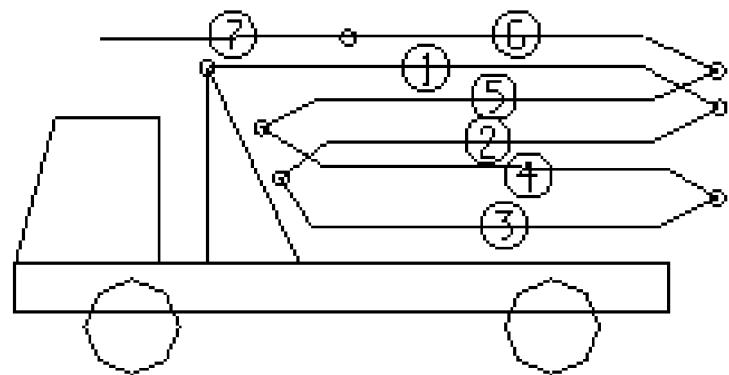


Fig. 4

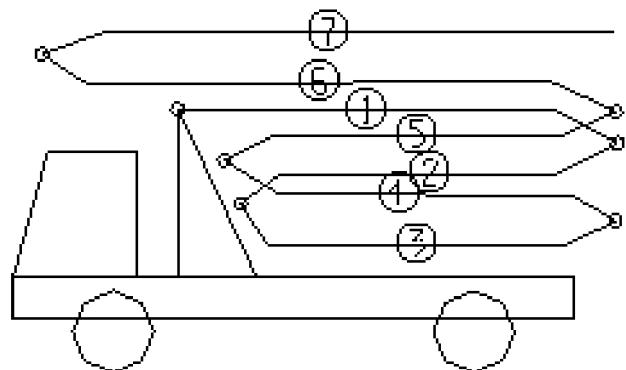


Fig. 5

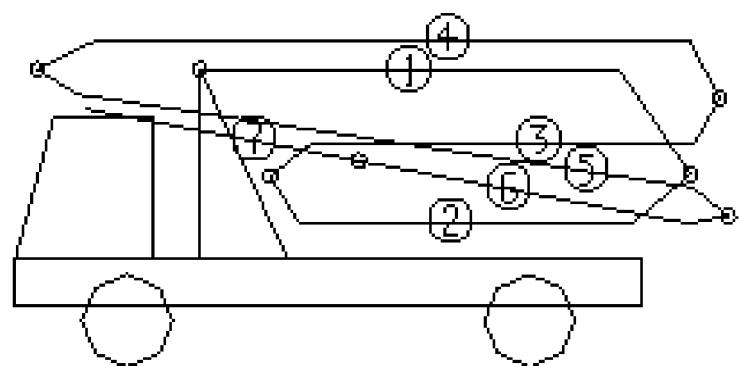


Fig. 6

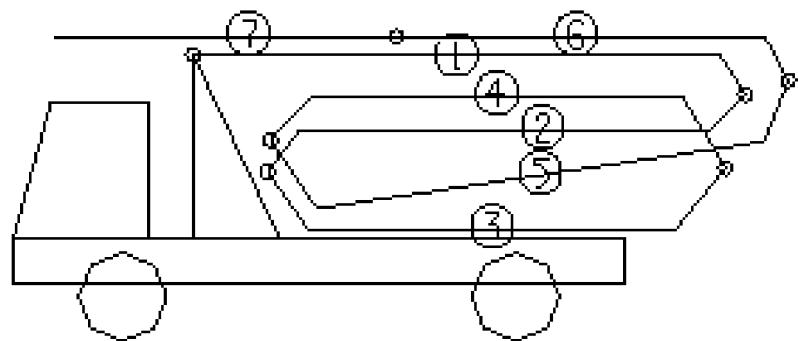


Fig. 7

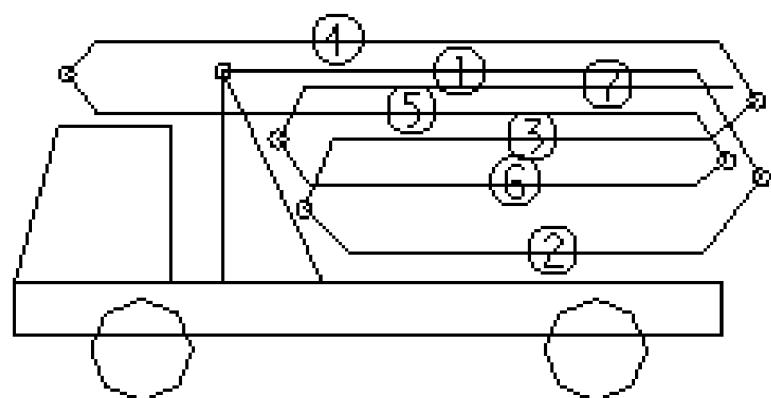


Fig. 8

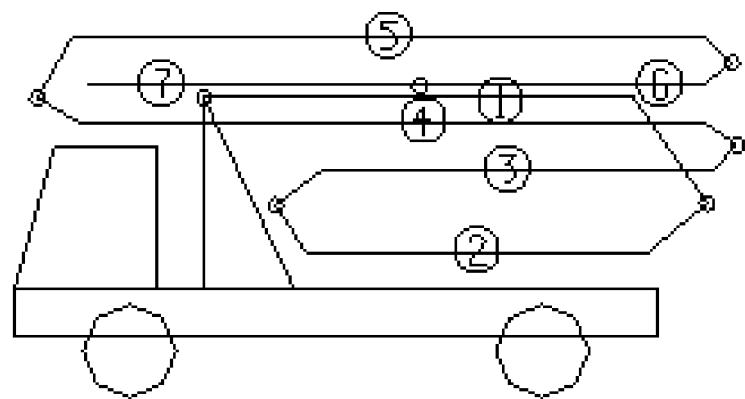


Fig. 9

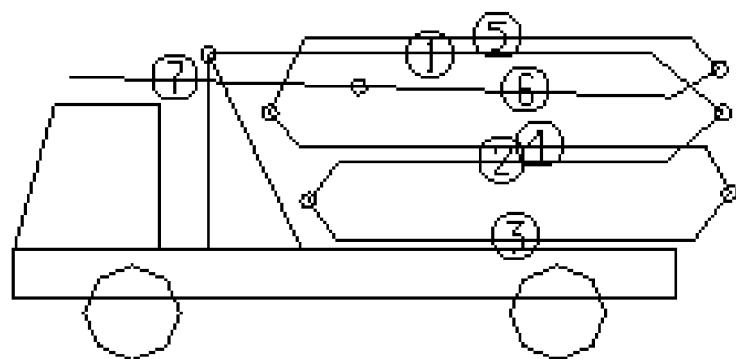


Fig. 10

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2012/082697

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A. CLASSIFICATION OF SUBJECT MATTER

E04G 21/04 (2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: E04G, B66, B60, B65

15

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

20

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

EPODOC, WPI, CNPAT, CNTXT, CNKI: pumper, arm stand, joint, withdraw, concrete, pump, cantilever, arm, mast, fold+, collaps+, line, align+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
PX	CN 102518305 A (ZOOMLION HEAVY INDUSTRY SCIENCE&TECHNOLOGY DEVELOPMENT CO., LTD.), 27 June 2012 (27.06.2012), claims 1-10, description, pages 2-5, and figures 1-10	1-10
Y	CN 102182319 A (SANY HEAVY INDUSTRY CO., LTD.), 14 September 2011 (14.09.2011), description, pages 2-4, claims 1-10, and figures 1-8	1-10
Y	CN 201447874 U (CHANGSHA ZOOMLION HEAVY INDUSTRY SCIENCE & TECHNOLOGY DEVELOPMENT CO., LTD.), 05 May 2010 (05.05.2010), description, pages 1-2, and figures 1-5	1-10
A	CN 201598834 U (SANY HEAVY INDUSTRY CO., LTD.), 06 October 2010 (06.10.2010), the whole document	1-10
A	DE 102008013990 A1 (PUTZMEISTER CONCRETE PUMPS), 17 September 2009 (17.09.2009), the whole document	1-10

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

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* Special categories of cited documents:	“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
“A” document defining the general state of the art which is not considered to be of particular relevance	“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
“E” earlier application or patent but published on or after the international filing date	“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	“&” document member of the same patent family
“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	

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Date of the actual completion of the international search 06 December 2012 (06.12.2012)	Date of mailing of the international search report 03 January 2013 (03.01.2013)
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Name and mailing address of the ISA/CN: State Intellectual Property Office of the P. R. China No. 6, Xitucheng Road, Jimenqiao Haidian District, Beijing 100088, China Facsimile No.: (86-10) 62019451	Authorized officer LUO, Xiqiu Telephone No.: (86-10) 62084182
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Form PCT/ISA/210 (second sheet) (July 2009)

5 **INTERNATIONAL SEARCH REPORT**
10 Information on patent family members

15 International application No.

20 **PCT/CN2012/082697**

25	Patent Documents referred in the Report	30 Publication Date	35 Patent Family	40 Publication Date
30	CN 102518305 A	35 27.06.2012	40 None	45
35	CN 102182319 A	50 14.09.2011	55 None	60
40	CN 201447874 U	65 05.05.2010	70 None	75
45	CN 201598834 U	80 06.10.2010	85 None	90
50	DE 102008013990 A1	95 17.09.2009	100 None	105

55 Form PCT/ISA/210 (patent family annex) (July 2009)