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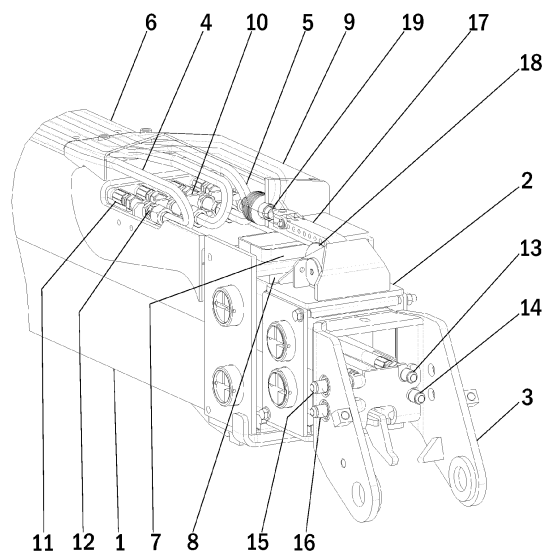
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(54) **A telescopic crane and a telescopic boom arrangement of a telescopic crane**

(57) The present invention relates to lifting equipment and cranes used for lifting and loading within the transportation industry, energy industry, process industry and manufacturing industry, and more particularly to a telescopic crane and a telescopic boom arrangement of a telescopic crane. A telescopic crane according to the present invention has a telescopic boom arrangement comprising an articulated arm (1); at least one extendable arm (2), (3); hydraulic pipe conduits (4), (5) arranged on top of said articulated arm (1); and a sliding bearing arrangement (7), (8) arranged at the end region of said articulated arm (1), which telescopic boom arrangement further comprises an opening for said hydraulic pipe conduits (4), (5) on the upper face of said articulated arm (1), which opening is located on the side of said articulated arm (1) so that said hydraulic pipe conduits (4), (5) are at a distance from said sliding bearing arrangement (7), (8) so that said hydraulic pipe conduits (4), (5) lead to hose connections (10), (11) accessible through said opening.



**Fig. 2**

## Description

### FIELD OF THE INVENTION

**[0001]** The present invention relates to the field of lifting equipment and cranes used for lifting and loading within the transportation industry, energy industry, process industry and manufacturing industry, and more particularly to a telescopic crane and a telescopic boom arrangement of a telescopic crane.

### BACKGROUND OF THE INVENTION

**[0002]** Lifting equipment and cranes are used in industry for different applications, such as loading and unloading within the transportation industry and bulk material and other material handling within the process and manufacturing industry as well as within the energy industry. A crane is generally defined as a machine for lifting and moving heavy objects by means of ropes or cables suspended from a movable arm. One of the most common crane types is a telescopic crane. Telescopic cranes are special type of jib cranes having a telescopic jib or boom. Telescopic cranes are also often referred to as loader cranes, articulating cranes or knuckle-boom cranes. A telescopic crane has typically a hydraulically-powered articulated arm having one or more of the arm sections telescopic.

**[0003]** Telescopic cranes are used in industry for different applications these including handling of bulk material, such as coal, mineral, scrap metal and other material within the process and manufacturing industry as well as within the energy industry. Telescopic cranes are also typically used within the transportation industry as loading and unloading material these including loading and unloading of timber, bulk material, scrap metal and other material. The telescopic crane may also be a mobile crane or a truck-mounted crane. A truck-mounted telescopic crane is often a crane in which the numerous telescopic arm sections may be folded into a small space when the crane is not in use. Within forestry telescopic cranes are used in e.g. timber trucks for loading and unloading of timber.

**[0004]** One typical example of a telescopic crane according to the prior art may be seen in US Patent document US 7,311,489 B2, which presents a telescopic crane having an extendable telescopic arm structure, in which the hydraulic hoses are fitted outside the telescopic end-side inner arm portion. Another typical example of a telescopic crane according to the prior art may be seen in US Patent document US 3,893,480. In US 3,893,480 the hydraulic hoses are fitted inside the articulated arm of the telescopic crane and a separate coaxial hydraulic conduit is fitted outside the telescopic end-side inner arm portion when said arm is extended. When the telescopic end-side inner arm of US 3,893,480 is retracted, the coaxial hydraulic conduit slides inside the articulated arm of the telescopic crane.

**[0005]** Some of the typical telescopic cranes according to the prior art are designed to have the hydraulic hoses and pipes fitted inside the articulated arm and the telescopic end-side inner arm portion of the telescopic crane.

Two typical examples of this type of telescopic cranes according to the prior art may be seen in US Patent documents US 5,924,837 and US 6,530,742 B2. Although the hoses and pipes may be somewhat safe from external objects these types of hoses are difficult to maintain or adjust.

**[0006]** European Patent documents EP 1842823 B1 and EP 2135836 B1 show a telescopic crane according to the prior art where in the connections for the hydraulic hoses are fitted to a special mounting block arranged in the end region of the articulated arm and in the interior of the crane arm pipe conduits lead to connections fitted to said mounting block. The prior art telescopic cranes, where both the hydraulic pipe conduits and the hydraulic hoses are fitted inside the telescopic crane structure have some problems. As the hydraulic pipe conduits and the hydraulic hoses are tight and confined fitted inside the telescopic crane structure the pipes and the hoses may wear against the moving telescopic boom parts. In order to fit the pipes and hoses inside there is a need to make the telescopic crane arms wider than otherwise necessary which consumes more material and increases the weight of the crane. Wider telescopic crane arms also increase the space and weight in transportation. Wider telescopic crane arms are also inconvenient in use as they block the visibility of the user. Furthermore, with this type of prior art telescopic cranes the hydraulic pipe conduits need to be narrow to fit inside the telescopic crane structure. Narrow hydraulic conduits increase the pressure drop caused by the resistance of flow. Furthermore, the special mounting block of a telescopic crane according to the prior art is complex and expensive to manufacture. Also the chain leading to inside the articulated arm is difficult to replace and cannot be easily tightened. Furthermore, the changing of the slide shoe is very troublesome and subject to dirt as the pipes and the hoses need to be disconnected.

**[0007]** In today's demanding environment, the manufacturers of telescopic cranes are constantly looking for improvements and cost savings in the crane manufacturing. Likewise, there is also a demand in the market for a new type of a telescopic crane and a telescopic boom arrangement of a telescopic crane which would improve the use of the crane and ease the crane maintenance process when compared to the current prior art solutions.

### BRIEF DESCRIPTION OF THE INVENTION

**[0008]** An object of the present invention is thus to provide a method and an apparatus for implementing the method so as to overcome the above problems and to alleviate the above disadvantages.

**[0009]** The objects of the invention are achieved by a telescopic boom arrangement of a telescopic crane, said

telescopic boom arrangement comprising an articulated arm; at least one extendable arm; hydraulic pipe conduits arranged on top of said articulated arm; and a sliding bearing arrangement arranged at the end region of said articulated arm; which said telescopic boom arrangement further comprises an opening for said hydraulic pipe conduits on the upper face of said articulated arm, which opening is located on the side of said articulated arm so that said hydraulic pipe conduits are at a distance from said sliding bearing arrangement so that said hydraulic pipe conduits lead to hose connections accessible through said opening.

**[0010]** Preferably, said opening is at least partially covered with a removable cover arranged at the arm region of said articulated arm. Preferably, said at least one extendable arm comprises an extendable crane-side outer arm and a further extendable end-side inner arm. Preferably, the telescopic boom arrangement further comprises a cover, so that said hydraulic pipe conduits are at least partially covered with said cover.

**[0011]** Preferably, the sliding bearing arrangement comprises a sliding bearing housing and a sliding bearing. More preferably, the sliding bearing has a sliding surface made of any kind of suitable sliding bearing material, such as e.g. bearing plastic or composite material or copper-plated steel with a sintered porous tin bronze layer with a polytetrafluoroethylene cover filling or copper-plated steel with a sintered tin bronze layer with a polyoxymethylene cover layer.

**[0012]** Preferably, said distance between said hydraulic pipe conduits and said sliding bearing arrangement is 1-100 centimetres. Alternatively, said distance between said hydraulic pipe conduits and said sliding bearing arrangement is 5-25 centimetres.

**[0013]** Preferably, said hose connections for the hydraulic pipe conduits comprise adjustable connectors. Preferably, the telescopic boom arrangement comprises hydraulic hose conduits leading from said hose connections to hose connections arranged at the end-side inner arm.

**[0014]** Preferably, the telescopic boom arrangement comprises a chain extending from the articulated arm over a chain wheel arranged at the crane-side outer arm to the end-side inner arm. More preferably, the said chain is connected to a chain tensioner arranged at the end region of the articulated arm. Preferably, the telescopic boom arrangement comprises two or more cylinders for moving the at least one extendable arm.

**[0015]** Furthermore, the objects of the invention are achieved by a telescopic crane having a telescopic boom arrangement comprising an articulated arm; at least one extendable arm; hydraulic pipe conduits arranged on top of said articulated arm; and a sliding bearing arrangement arranged at the end region of said articulated arm; in which telescopic crane said telescopic boom arrangement further comprises an opening for said hydraulic pipe conduits on the upper face of said articulated arm, which opening is located on the side of said articulated arm so

that said hydraulic pipe conduits are at a distance from said sliding bearing arrangement so that said hydraulic pipe conduits lead to hose connections accessible through said opening.

**[0016]** Preferably in the telescopic crane, said opening is at least partially covered with a removable cover arranged at the arm region of said articulated arm. Preferably in the telescopic crane, said at least one extendable arm comprises an extendable crane-side outer arm and a further extendable end-side inner arm. Preferably in the telescopic crane, the telescopic boom arrangement further comprises a cover, so that said hydraulic pipe conduits are at least partially covered with said cover.

**[0017]** Preferably in the telescopic crane, said hose connections for the hydraulic pipe conduits comprise adjustable connectors. Preferably in the telescopic crane, the telescopic boom arrangement comprises hydraulic hose conduits leading from said hose connections to hose connections arranged at the end-side inner arm.

**[0018]** Preferably in the telescopic crane, the telescopic boom arrangement comprises a chain extending from the articulated arm over a chain wheel arranged at the crane-side outer arm to the end-side inner arm. More preferably in the telescopic crane, said chain is connected to a chain tensioner arranged at the end region of the articulated arm. Preferably in the telescopic crane, the telescopic boom arrangement comprises two or more cylinders for moving the at least one extendable arm.

## BRIEF DESCRIPTION OF THE DRAWINGS

### **[0019]**

Figure 1 shows one embodiment of a telescopic boom arrangement of a telescopic crane according to the present invention;

Figure 2 shows a detailed view of one embodiment of a telescopic boom arrangement of a telescopic crane according to the present invention.

**[0020]** In the following, the invention will be described in greater detail by means of preferred embodiments with reference to the accompanying drawings of Figures 1 to 2.

## DETAILED DESCRIPTION OF THE INVENTION

**[0021]** Figure 1 shows one embodiment of a telescopic boom arrangement of a telescopic crane according to the present invention. The telescopic boom arrangement of a telescopic crane according to the present invention comprises an articulated arm 1, an extendable crane-side outer arm 2 and a further extendable end-side inner arm 3. The telescopic boom arrangement of a telescopic crane further comprises hydraulic pipe conduits 4, 5, which hydraulic pipe conduits 4, 5 are arranged on top of the articulated arm 1 of the telescopic crane. The hydraulic pipe conduits 4, 5 are at least partially covered

with a cover 6. The telescopic boom arrangement of a telescopic crane according to the present invention also comprises a sliding bearing housing 7 and a sliding bearing 8 arranged at the end region of the articulated arm 1 of the telescopic crane. The articulated arm 1 of the telescopic boom arrangement of a telescopic crane according to the present invention has an opening for the hydraulic pipe conduits 4, 5 on the upper face of the articulated arm 1. Said opening is located on the side of the articulated arm 1 so that the hydraulic pipe conduits 4, 5 are at a distance from the sliding bearing housing 7 and a sliding bearing 8 arranged at the end region of the articulated arm 1 of the telescopic crane. The opening for the hydraulic pipe conduits 4, 5 may be at least partially covered with a removable cover 9 arranged at the arm region of the articulated arm 1.

**[0022]** Figure 2 shows a detailed view of one embodiment of a telescopic boom arrangement of a telescopic crane according to the present invention. The telescopic boom arrangement of a telescopic crane according to the present invention comprises an articulated arm 1, an extendable crane-side outer arm 2 and an extendable end-side inner arm 3. The telescopic boom arrangement of a telescopic crane further comprises hydraulic pipe conduits 4, 5 are arranged on top of the articulated arm 1 of the telescopic crane, which hydraulic pipe conduits 4, 5 are at least partially covered with a cover 6. The telescopic boom arrangement of a telescopic crane according to the present invention also comprises a sliding bearing housing 7 and a sliding bearing 8 arranged at the end region of the articulated arm 1 of the telescopic crane. The sliding bearing 8 and the sliding bearing housing 7 are arranged separately at the end region of the articulated arm 1 of the telescopic crane. The sliding bearing 8 can therefore be easily maintained or replaced.

**[0023]** The articulated arm 1 of the telescopic boom arrangement of a telescopic crane according to the present invention has an opening for the hydraulic pipe conduits 4, 5 on the upper face of the articulated arm 1. The opening for the hydraulic pipe conduits 4, 5 is located in the arm region towards the crane-side so that the hydraulic pipe conduits 4, 5 are at a distance from the sliding bearing housing 7 of the articulated arm 1 and from the sliding bearing 8 arranged at the end region of the articulated arm 1 of the telescopic crane. In the telescopic boom arrangement of a telescopic crane according to the present invention said distance between said hydraulic pipe conduits 4, 5 and said sliding bearing arrangement 7, 8 may be 1-100 centimetres, and more typically 5-25 centimetres.

**[0024]** In the telescopic boom arrangement of a telescopic crane according to the present invention the hydraulic pipe conduits 4, 5 lead to hose connections 10, 11 accessible through said opening on the upper face of the articulated arm 1. Said hose connections 10, 11 for the hydraulic pipe conduits 4, 5 may comprise adjustable connectors 12. In the telescopic boom arrangement of a telescopic crane according to the present invention hy-

draulic hose conduits lead from said hose connections 10, 11 to hose connections 13-16 arranged at the end-side inner arm 3. The hose connections 13-16 may be arranged straight 13-14 at the end-side inner arm 3 or arranged with an angle connector 15-16 at the end-side inner arm.

**[0025]** In the telescopic boom arrangement of a telescopic crane according to the present invention the opening for the hydraulic pipe conduits 4, 5 may be covered with a removable cover 9 arranged at the arm region of the articulated arm 1. When said removable cover 9 is removed the hose connections 10, 11 for the hydraulic pipe conduits 4, 5 are accessible. The hydraulic hose conduits may be easily maintained or replaced by opening the hose connections 10, 11. Furthermore, the hydraulic hose conduits may be easily adjusted or tightened with the help of the adjustable connectors 12 also accessible through the opening on the upper face of the articulated arm 1 when the removable cover 9 is removed.

The telescopic boom arrangement of a telescopic crane according to the present invention may also comprise a chain 17 which extends from the articulated arm over a chain wheel 18 arranged at the crane-side outer arm 2 to the end-side inner arm 3, and which chain 17 is connected to a chain tensioner 19 arranged at the end region of the articulated arm 1 of the telescopic crane. The telescopic boom arrangement of a telescopic crane according to the present invention may alternatively comprise two or more cylinders for moving the crane-side outer arm 2 and the end-side inner arm 3.

**[0026]** In the telescopic boom arrangement of a telescopic crane according to the present invention the sliding bearing 8 may have a sliding surface made of any kind of suitable sliding bearing material, such as e.g. bearing plastic or composite material or copper-plated steel with a sintered porous tin bronze layer with a polytetrafluoroethylene cover filling or copper-plated steel with a sintered tin bronze layer with a polyoxymethylene cover layer.

**[0027]** In the telescopic boom arrangement of a telescopic crane according to the present invention the pipe conduits may be designed to be greater in diameter than in the arrangement according to prior art as they do not need to fit inside the telescopic crane structure. Likewise, the hose conduits may be designed to be greater in diameter than in the arrangement according to prior art as they fit easier inside the telescopic crane structure. The hose conduits have more space and are not so easily subjected to wear against the moving telescopic boom parts. With greater pipe and hose conduits there is not as much pressure drop caused by the resistance of flow.

**[0028]** With the help of the solution according to the present invention the manufacturers of telescopic cranes may design the telescopic crane arms narrower wider than with the prior art solutions. Narrower telescopic crane arms save space and ease the transportation. Narrower telescopic crane arms are also convenient in use as they increase the visibility of the user when compared

with the prior art solutions.

[0029] It will be obvious to a person skilled in the art that, as the technology advances, the inventive concept can be implemented in various ways. The invention and its embodiments are not limited to the examples described above but may vary within the scope of the claims.

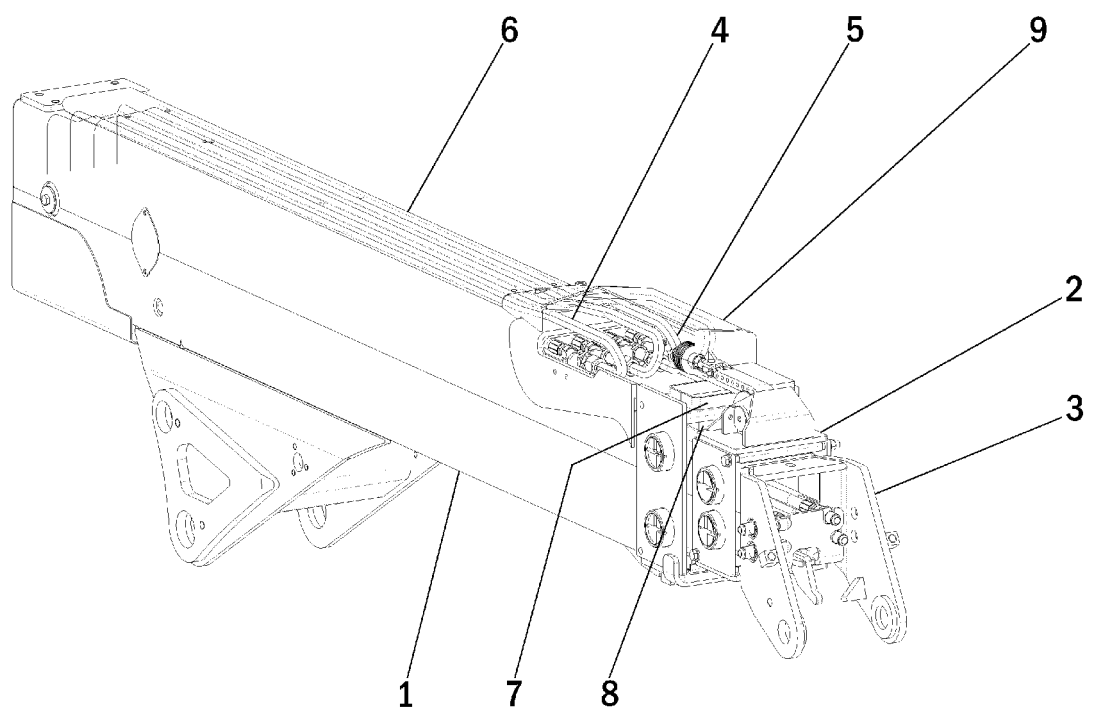
## Claims

1. A telescopic boom arrangement of a telescopic crane, said telescopic boom arrangement comprising an articulated arm (1); at least one extendable arm (2), (3); hydraulic pipe conduits (4), (5) arranged on top of said articulated arm (1); and a sliding bearing arrangement (7), (8) arranged at the end region of said articulated arm (1),  
**characterized in that** said telescopic boom arrangement further comprises an opening for said hydraulic pipe conduits (4), (5) on the upper face of said articulated arm (1), which opening is located on the side of said articulated arm (1) so that said hydraulic pipe conduits (4), (5) are at a distance from said sliding bearing arrangement (7), (8) so that said hydraulic pipe conduits (4), (5) lead to hose connections (10), (11) accessible through said opening.
2. A telescopic boom arrangement according to claim 1, **characterized in that** said opening is at least partially covered with a removable cover (9) arranged at the arm region of said articulated arm (1).
3. A telescopic boom arrangement according to claim 1 or claim 2, **characterized in that** said at least one extendable arm (2), (3) comprises an extendable crane-side outer arm (2) and a further extendable end-side inner arm (3).
4. A telescopic boom arrangement according to any one of claims 1 to 3, **characterized in that** the telescopic boom arrangement further comprises a cover (6), so that said hydraulic pipe conduits (4), (5) are at least partially covered with said cover (6).
5. A telescopic boom arrangement according to any one of claims 1 to 4, **characterized in that** that the sliding bearing arrangement (7), (8) comprises a sliding bearing housing (7) and a sliding bearing (8).
6. A telescopic boom arrangement according to claim 5, **characterized in that** the sliding bearing (8) has a sliding surface made of any kind of suitable sliding bearing material, such as e.g. bearing plastic or composite material or copper-plated steel with a sintered porous tin bronze layer with a polytetrafluoroethylene cover filling or copper-plated steel with a sintered tin bronze layer with a polyoxymethylene cover layer.
7. A telescopic boom arrangement according to any one of claims 1 to 6, **characterized in that** said distance between said hydraulic pipe conduits (4), (5) and said sliding bearing arrangement (7), (8) is 1-100 centimetres.
8. A telescopic boom arrangement according to any one of claims 1 to 6, **characterized in that** said distance between said hydraulic pipe conduits (4), (5) and said sliding bearing arrangement (7), (8) is 5-25 centimetres.
9. A telescopic boom arrangement according to any one of claims 1 to 6, **characterized in that** said hose connections (10), (11) for the hydraulic pipe conduits (4), (5) comprise adjustable connectors (12).
10. A telescopic boom arrangement according to any one of claims 1 to 9, **characterized in that** the telescopic boom arrangement comprises hydraulic hose conduits leading from said hose connections (10), (11) to hose connections (13)-(16) arranged at the end-side inner arm (3).
11. A telescopic boom arrangement according to any one of claims 1 to 10, **characterized in that** the telescopic boom arrangement comprises a chain (17) extending from the articulated arm over a chain wheel (18) arranged at the crane-side outer arm (2) to the end-side inner arm (3).
12. A telescopic boom arrangement according to claim 11, **characterized in that** said chain (17) is connected to a chain tensioner (19) arranged at the end region of the articulated arm (1).
13. A telescopic boom arrangement according to any one of claims 1 to 10, **characterized in that** the telescopic boom arrangement comprises two or more cylinders for moving the at least one extendable arm (2), (3).
14. A telescopic crane having a telescopic boom arrangement comprising an articulated arm (1); at least one extendable arm (2), (3); hydraulic pipe conduits (4), (5) arranged on top of said articulated arm (1); and a sliding bearing arrangement (7), (8) arranged at the end region of said articulated arm (1),  
**characterized in that** said telescopic boom arrangement further comprises an opening for said hydraulic pipe conduits (4), (5) on the upper face of said articulated arm (1), which opening is located on the side of said articulated arm (1) so that said hydraulic pipe conduits (4), (5) are at a distance from said sliding bearing arrangement (7), (8) so that said hydraulic pipe conduits (4), (5) lead to hose connections (10), (11) accessible through said opening.

15. A telescopic crane according to claim 14, **characterized in that** said opening is at least partially covered with a removable cover (9) arranged at the arm region of said articulated arm (1). 5
16. A telescopic crane according to claim 14 or claim 15, **characterized in that** said at least one extendable arm (2), (3) comprises an extendable crane-side outer arm (2) and a further extendable end-side inner arm (3). 10
17. A telescopic crane according to any one of claims 14 to 16, **characterized in that** the telescopic boom arrangement further comprises a cover (6), so that said hydraulic pipe conduits (4), (5) are at least partially covered with said cover (6). 15
18. A telescopic crane according to any one of claims 14 to 17, **characterized in that** said hose connections (10), (11) for the hydraulic pipe conduits (4), (5) comprise adjustable connectors (12). 20
19. A telescopic crane according to any one of claims 14 to 18, **characterized in that** the telescopic boom arrangement comprises hydraulic hose conduits leading from said hose connections (10), (11) to hose connections (13)-(16) arranged at the end-side inner arm (3). 25
20. A telescopic crane according to any one of claims 14 to 19, **characterized in that** the telescopic boom arrangement comprises a chain (17) extending from the articulated arm over a chain wheel (18) arranged at the crane-side outer arm (2) to the end-side inner arm (3). 30 35
21. A telescopic crane according to claim 20, **characterized in that** said chain (17) is connected to a chain tensioner (19) arranged at the end region of the articulated arm (1). 40
22. A telescopic crane according to any one of claims 14 to 19, **characterized in that** the telescopic boom arrangement comprises two or more cylinders for moving the at least one extendable arm (2), (3). 45

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**Fig. 1**

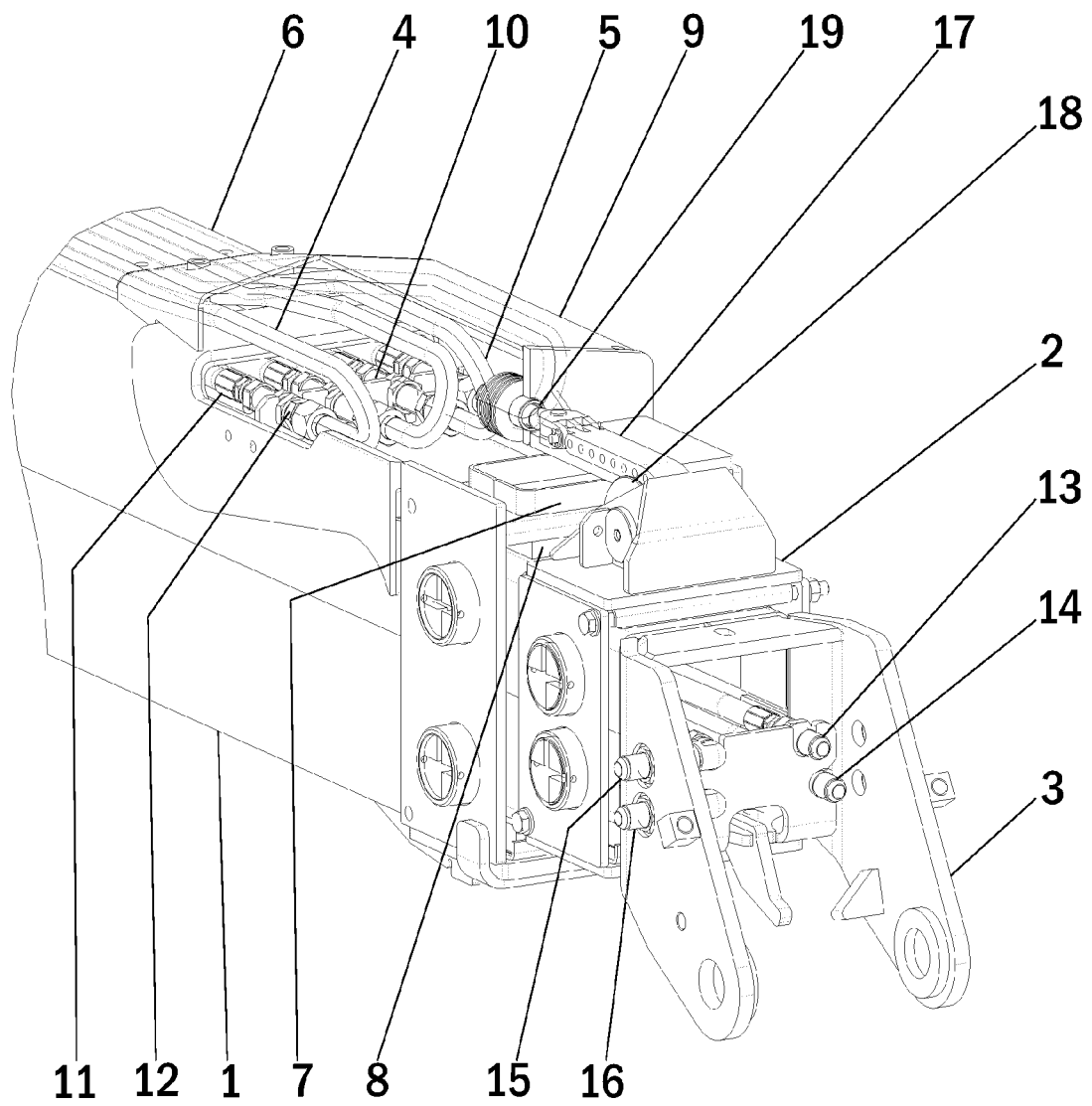


Fig. 2





## EUROPEAN SEARCH REPORT

Application Number  
EP 12 18 6518

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B66C
Place of search		Date of completion of the search	
The Hague		3 January 2013	
Examiner		Rupcic, Zoran	
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons &amp; : member of the same patent family, corresponding document</p>			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 12 18 6518

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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03-01-2013

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